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Editorial Notes

Corrosion

THE story of The Institution of Gas Engineers and "Corrosion from Products of Combustion," does not lack length. It commenced in 1932 when the General Research Committee authorized an investigation to unravel the problems involved, the work being entrusted to Mr. J. W. Wood. The first Report on the subject—the 33rd Report of the Joint Research Committee—was presented at the Autumn Research Meeting of the Institution in the November of the following year. At that meeting, during the discussion on the Report, Dr. Harold Hartley put forward the view that in authorizing the investigation the General Research Committee were in fact burying their heads in the sand. What, he said, needed investigation was the problem of removing sulphur from coal gas. The "Sulphur Must Go" slogan was given birth. Commenting on that Report we remarked: "Corrosion of appliances costs our Industry dear; and apart from the money spent on apparatus there is the question of the goodwill of the consumer. We must do something, and quickly, to remedy this wastage caused by corrosion. . . . There is no denying that sulphur dioxide stinks; and stinks are bad for the Gas Industry. They are bad for the lighting load and they are bad for the employment of perfectly safe appliances unconnected with a flue."

The years passed. 1934, 1935, 1936 saw further Reports on this subject of "Corrosion from Products of Combustion." They were good Reports packed with interesting and useful information. The whole of the work was characterized by thoroughness. The 38th Report of the Joint Research Committee was submitted to the Institution in 1936, and it concluded with the statement that "the experiments as a whole show that by reducing the sulphur content of town gas a considerable reduction in corrosion was effected in circumstances favouring the condensation of the water produced by the combustion of the gas." So this, said Dr. Hartley at the meeting at which the Report was under discussion, represents the result to date of three years' work by two chemists and an expenditure which must have run into a considerable amount. Yet the fact was generally known prior to the initiation of the work. "The very guarded remarks in this concluding Corrosion Report," he observed, "seem to suggest either a scrupulous regard for terms of reference or an unwillingness on the part of the Committee guiding the research to recognise the realities of the position. I presume the publication of these Corrosion Reports can be taken to indicate that the Institution officially recognizes that the presence of sulphur compounds is harmful in so far at least as the life of appliances is concerned. I do hope those responsible for the making and supply of coal gas realize that in their own interests they must really do something about this sulphur question."

Increased Popularity Ignored

IN the same year, 1936, which saw the conclusion of the Institution Corrosion Reports, a Report was presented on the removal of sulphur compounds from town gas down to 10 grains per 100 cu.ft. It was stated in this that a general reduction on these lines *throughout the Gas Industry* (the italics are ours) would be directly beneficial to the consumer in many ways, notably in reducing corrosion of heating appliances, in enabling flueless appliances to be more generally used without nuisance from the smell of sulphur oxides, and in improving furnace atmospheres in the heat treatment and more particularly the bright annealing of metals. We quote from that 1936 Report: "These benefits would lead to an increased popularity and more widespread use of gas." The year previous to that the Gas Research Fellow was giving the results of an investigation on the scaling of mild steel in sulphur-free and sulphur-containing furnace atmospheres, and in his Communication it was stated that in 1929 the production of steel in Great Britain was approximately 9,500,000 tons, while the average price was £8 per ton. Thus, in manufacture the loss of every 1% of the metal by scaling would mean a loss of 95,000 tons and £760,000. In gauging the total loss by furnace operations it has to be taken into account that any steel article in the finished condition has of necessity been heated a number of times, each incurring its own loss. Moreover, the actual monetary loss is much increased from the effect of surface deterioration in necessitating machining, from the production of wasters outside specified dimensions, and from the malign influence exerted by a roughened or

deteriorated surface on processes in which a coating of another metal has to be applied to the steel.

The experiments described in that Report were directed towards the influence of sulphur in amounts such as might occur in the "normal combustion of ordinary fuels." It was demonstrated that "in these circumstances, which are those of practice, the influence of the sulphur compounds is *remarkable in its magnitude*." Again the italics are ours. In 1936 the Gas Research Fellow submitted another Report on the same subject. That Report illustrated the remarkable attack of sulphur dioxide on some special alloy steels. It penetrates the metal with harmful results, and the change in structure of the metal is as important as the effect of scaling. The rate and amount of scale formation, it was found, is not the only determining factor in the preference for gas low in sulphur. When that Report was under discussion the merits of a low-sulphur gas in other industrial processes were mentioned. Mr. Bloor explained how a reduction in sulphur compounds in the gas at York had eliminated the trouble of the formation of a bloom on the finished product when a gas with a high sulphur content was used for glass melting. Mr. Mackay, of Stoke-on-Trent, remarked that a low-sulphur gas had made possible direct firing of pottery ware, eliminating the heat wastage due to the employment of muffle ovens, saggars, or other protective material.

The Time Element

THERE seemed to be a case for the reduction of sulphur compounds from town gas. That was in 1936. In 1937, under the title of "Removal of Sulphur Compounds from Gas," were grouped three Papers by members of the technical staff of the Gas Light and Coke Company. They comprised Communication No. 175 of The Institution of Gas Engineers, in which the various processes for the removal of sulphur compounds were again reviewed and a "possible line of future development" was indicated. The Communication was presented at the 9th Autumn Research Meeting of the Institution. At this meeting Mr. Hollings, of the Gas Light and Coke Company, said: "Whatever may be the cost of removing carbon bisulphide from the benzole when we have recovered it, that cost expressed as so much per unit of gas treated is so small a price to pay for having a low-sulphur gas that *we should get on with the work anyhow*." Once again the italics are ours.

"We should get on with the work anyhow." We have urged this for years in these columns, just as we have urged the recovery of benzole from gas, in peace-time and in war-time. Benzole is now being recovered. Reduction in the sulphur content of gas must come. Continually we have emphasized that "Sulphur must go" must not remain a mere slogan. The cost of removing sulphur is infinitesimal compared with the economic and prestige advantages which would accompany its riddance. That is our view. It is not as yet shared universally among gas undertakings in this country; more's the pity. Since the outbreak of war meetings have been held at which the opinion has been voiced that sulphur reduction is a matter of minor consequence. Discussing these meetings in the "JOURNAL" of Nov. 29 last we said: "There has been unreality in the air . . . There has been a lukewarm atmosphere—a sense of failure. And as for tying-up benzole recovery with an obvious advantage to the whole future of the Gas Industry—that of the reduction of sulphur compounds from town gas—that indeed would be a grave step. The merits and demerits of taking this foolhardy plunge will, we presume, be considered afresh (and with dignity and seriousness) at an Institution research meeting some years after the present war is ended." Why, on this question of sulphur reduction, is the Gas Industry so slow to act? Sulphur dioxide stinks; stinks are bad for the Gas Industry.

Latest Results

THE work on corrosion sponsored by the Institution came to an end, as we have mentioned, with the publication of the fourth Report on the subject in 1936. In the experiments comprising that work almost the whole of the water produced by the combustion of the gas was condensed on the test pieces, and a large proportion of the corrosion product was removed in the condensate. With gas appliances it frequently happens that only a portion of the water is condensed, and the condensate runs into hotter regions where it is continuously re-evaporated and concentrated. Under these conditions severe local attack is possible, with the building up of corrosion deposits such as may cause blocking of flue-ways and have an adverse effect upon combustion. This aspect of the problem was about to be investigated when the corrosion work was suspended in 1936. It was, however, regarded by Professor Cobb as of sufficient importance to warrant continuance of the investigation at the University of Leeds, and the work was carried out by Mr. Frank Taylor in consultation with Mr. Wood, and the results were to have been presented, had it not been for the war, at a research meeting of the Institution last November. In the circumstances they were published as a blue book—Communication No. 224.

The materials examined were solder-coated and tinned copped, aluminium of various degrees of purity, copper, brass, mild steel, chemical lead and tellurium lead, monel metal, and nickel. The experiments were made with town gas containing 22 grains of sulphur per 100 cu.ft. and the same gas with the sulphur content reduced to 5 grains per 100 cu.ft. The order in which the metals could be placed in regard to resistance to attack was not seriously different from that previously reported, but under conditions of condensation and re-evaporation the attack was roughly twice as severe and was aggravated by localization. The investigation was a careful piece of work and the results are admirably reported. It has brought further emphasis to the fact that the physical condition of the corrosion product and its effect upon combustion by causing blockage of flue-ways is almost as important as the actual amount of deposit. The information set out in the Paper will prove of value, and there is no doubt that the experimental technique developed has a wide sphere of application. The fundamental note, however, is sounded in the last paragraph of the Paper, as follows: "The results of the experiments indicate clearly that reduction of the sulphur content of town gas from its common value of 20 to 30 grains to a figure of 5 grains per 100 cu.ft. would to a large extent benefit the utilization side of the Gas Industry by reducing maintenance and replacement charges." We would go much farther than this and point out once again that low-sulphur gas opens up a wider field of usage both in the home and in industry. Surely, more evidence is not required to encourage gas undertakings throughout the country to supply a low-sulphur gas.

Street Lighting Units

We referred last week to the issue of a document entitled "Information for applicants for licences to use the Registered Certification Mark of the British Standards Institution in connexion with lighting fittings complying with B.S./A.R.P. 37." An application for a licence should be accompanied by the following information: (a) Address of the works where the fitting is made; (b) a drawing of the fitting showing the essential constructional features, including tolerances on dimensions; (c) a test report issued by an approved independent testing authority—*e.g.*, National Physical Laboratory—to show that a fitting made in accordance with the drawing has been examined and tested and found to conform to the requirements of Clauses 3 and 6 of B.S./A.R.P. 37. Alternatively, in the first instance, a report of tests made in the applicant's own testing laboratory may be submitted, in which case a description of the test apparatus and particulars of the control exercised in maintaining the equipment in good order and proper calibration must be furnished; (d) an explanation of the routine

tests and inspection, and any other steps taken, or proposed to be taken, to secure that the whole output of fittings bearing the mark will be strictly in accordance with the sample which has been certified as complying with Clauses 3 and 6 of the specification.

Bodies other than manufacturers—*e.g.*, public lighting authorities—who desire to adapt or convert their existing lanterns can be licensed to mark the converted fittings under similar conditions as those applying to manufacturers. The certification mark must be associated with the number of the specification and with the licensee's name, Trade Mark, or B.S.I. Licence Number. The Specification also requires that the size of lamp or mantle and the nominal mounting height be marked on the fitting. The whole of this marking must be done in an approved form.

Flueless Rooms

The amount of fresh air required to keep body odours from becoming perceptible varies with the density of occupation and with the cleanliness of the occupants, but a figure of about 1,000 cu.ft. per person per hour is probably not far wrong as a rough average. This makes a powerful argument for the use of flues. For example, four people in a room of 1,500 cu.ft. would require a minimum of nearly three air changes an hour. This change is readily provided by a gas fire. Unfortunately the outbreak of war caused the suspension of an investigation at the London School of Hygiene and Tropical Medicine into the ventilation of dwelling houses and offices. The work which had been carried out, however, showed among other matters that the supposed saving to be made by constructing rooms without flues may be more than nullified by reducing the number of occupants that the room may hold if due regard is to be paid to health and comfort. We look forward to the publication of an interim report setting out the conclusions arrived at from this interesting investigation into a subject of great importance. The relation of subjective impressions of freshness to atmospheric conditions was studied some little time ago by Drs. Vernon, Warner, and Bedford; and Dr. Bedford in a recent Paper gave an outline of the results of a fresh analysis of the data obtained. The main requirements for a pleasing and invigorating environment were stated thus: The room should be as cool as is compatible with comfort. There should be adequate air movement. The air movement should be variable rather than uniform. The relative humidity of the air should be kept reasonably low. The average temperature of the walls and other surrounding surfaces should not be appreciably lower than that of the air; and the air at head level should not be distinctly warmer than that near the floor.

Personal

Mr. J. F. TYNDALL, who has been Manager of the Deal and Walmer Gas Company for many years, retired on Dec. 31. Mr. S. L. WRIGHT, who has been acting as Deputy Engineer and Manager of the Company since last July, has been appointed to succeed Mr. Tyndall in the capacity of Engineer and Manager.

* * *

Technical, clerical, and adminstrative staffs of the Stockport Corporation Gas Department have presented a radio set to Mr. R. WILLACY to mark his retirement on superannuation from the position of Secretary and Accountant in the Department after twenty years' service. The presentation was made by Mr. A. W. Elliott, the Deputy Gas Engineer.

* * *

Mr. Alan R. C. JOHNSTON, of Messrs. William Edgar & Son, Ltd., Hammersmith, who is at present serving on the Imperial General Staff, wishes to thank all old friends in the Gas Industry for their Christmas and New Year greetings and regrets that circumstances have prevented him from sending his own.

Obituary

Mr. W. A. S. CALDER, President of the Institute of Chemistry, has died at Worthing. A past-President of the Society of Chemical Industry and of the Institution of Chemical Engineers, he had also served on the Council of the Chemical Society, and at the time of his death he was a member of the Industrial Chemistry Committee of the Ministry of Labour.

* * *

We regret to report the death of Mr. ALFRED NORTON. For 55 years he was associated with Parkinson & Cowan (Gas Meters), Ltd., and its predecessors in the capacity of chief cashier, and later as representative for W. & B. Cowan in the South of England. He retired at the end of 1936 owing to failing health. His genial disposition and friendly nature won for him many friends in the Gas Industry who will be sorry to hear of his death.

Forthcoming Engagements

Jan.

13.—London and Southern Juniors.—Meeting at Gas Industry House, 3 p.m.

15.—L.C.C.A.—Finance Committee, 10.45 a.m.; Executive Committee, 11.15 a.m.; Central Committee, 2 p.m.

16.—L.C.C.A.—Technical Committee, 2 p.m.

18.—S.B.G.I.—Council Meeting, 56, Victoria Street, S.W.1, 2 p.m.

27.—Yorkshire Junior Gas Association.—Meeting at Leeds. Presidential Address.

31.—Conjoint Conference of Public Utility Associations.—Eighth Annual General Meeting, Gas Industry House, 3 p.m.

Standard Conditions of Contract

Amendment and Additions

The Institution of Gas Engineers and the Society of British Gas Industries approve and recommend for adoption forthwith and for the period of the present war and thereafter until otherwise agreed, the following Amendment and Addition to the Standard Conditions of Contract:

(a) The substitution of the following Amended Clause XXII for the existing Clause XXII—Responsibility for Damage.
(b) The addition of the following New Clause—Rise and Fall.

Amended Clause XXII—Responsibility for Damage

Subject to the provisions of Clause XIX, all loss from damage which may happen to the work or to the materials plant and implements used during the progress thereof by excessive rain tempest fire theft disappearance or civil aircraft shall fall upon and be borne by the Contractor without any extra charge to the other Contracting party but the Contractor shall not bear loss from damage attributable to any other cause originating outside the area of the contract work.

If during the continuance of this contract the work (including any materials plant and implements brought on to the site by the Contractor) sustain damage by reason or in consequence of War Invasion Act of Foreign Enemy Hostilities (whether War be declared or not) Civil War Rebellion Revolution Insurrection or Military or Usurped Power the loss occasioned by such damage shall be deemed to be the loss of the owner of the property damaged. For the purpose of this clause materials delivered and permanent work executed on the site shall be deemed to be the property of the other Contracting Party and materials, plant and implements which would normally be removed on the completion of the work shall be deemed to be the property of the Contractor.

The Contractor shall further be responsible for all damage consequent upon the carrying out of the work which he may do to adjoining structures or property and he must make good the same at his own cost to the satisfaction of the Engineer.

The Contractor shall not be responsible for any ordinary wear and tear to any roadways plant or buildings and he shall not be liable for and shall not be required to repair any damage or defects caused by such ordinary wear and tear as aforesaid.

New Clause—Rise and Fall

This tender is based upon the current cost of materials and existing rates of carriage freight and wages. If pending receipt of the order and during the execution and erection of the plant any modification should take place in the cost of materials, carriage or freight or in the rates of payment to labour, or should the cost of the work be affected by any statutory obligation imposed by the Government the estimated or contract price shall be increased or decreased by such an amount as shall fairly represent the increased or decreased cost thereof to the Contractor. This provision shall also apply to materials required for the execution of the contract and purchased from Sub-Contractors.

If requested, the Contractor shall submit a schedule setting forth the basic prices of materials and labour upon which the tender is estimated. The Contractor shall also, on request, furnish such evidence as may reasonably be required in order to satisfy the other contracting party regarding the amount of the increase or decrease, as the case may be.

Letters to the Editor

Compressed Gas for Motor Transport

SIR,—I have read with astonishment Mr. C. A. Masterman's contribution to the discussion of Messrs. Graham and Skinner's Paper presented to the Institute of Fuel entitled "Raising the Calorific Value of Gas for Motor Transport."

First of all, it is unfortunate that Mr. Masterman, as a Scientist and Research worker, did not confine his remarks to the subject of the Paper, but proceeded to make an ill-founded, and most damaging, attack on the commercial possibilities of the use of compressed gas for motor transport.

Those within the Gas Industry will be able to appraise Mr. Masterman's estimates of cost of operation at their true value in the knowledge that he is not a commercial man, but those outside who only know him as a person of eminence in our Industry must be adversely prejudiced by them. His assumption that no one would suggest the possibility of erecting gas-works and distributing gas to filling stations at a lower price per therm than about 6d. is wrong. On the basis of costs and charges existent prior to the outbreak of war, I put down large extensions of works and mains to sell industrial gas at prices ranging from 3d. to 4d. per therm as an economic proposition.

Both Mr. Masterman and Mr. Stewart in their contributions to the discussion assume 1¼ therms as being equivalent to one gallon of petrol. This, of course, is on the basis of the conversion of a low compression ratio self-induction type engine with gas/air mixer, giving from 15% to 20% less power output when operated on gas as compared with petrol. With a similar engine without alteration of the compression ratio but operating on the Erren principle, the patents for which are owned jointly by my Corporation and the National Gas and Oil Engine Co., Ltd., efficiencies have been obtained which give an equivalent of 0.95 therm, or, say, 1 therm, of gas per equivalent gallon of petrol. On high compression ratio Diesel type engines converted to the Erren system even higher overall thermal efficiencies have been obtained on the test bench, and these, it is anticipated, will be proved on the road on a 'bus which is at present undergoing trials in Lancashire.

Mr. Masterman puts down cost of compressors, cylinders, labour costs on account of compression, &c., as being equivalent to about 6d. per equivalent gallon of petrol, which, with his estimated prime cost of 7½d. (based on 6d. per therm) makes up a total of 1s. 1½d.; to this sum he adds garage and service charges of from 4½d. to 6½d. per equivalent gallon in ordjer to make up his figure of 1s. 6d. to 1s. 8d. I am at a loss to understand why he should assume that garages would be given several times the profit on the sale of gas that is made on the sale of petrol.

Mr. Masterman refers to the relative inflexibility of location of filling stations and the time required for filling, and I think it is generally agreed that comparatively small compressor units with storage bottles to deal with requirements up to 200 or 300 equivalent gallons a day are desirable. Sufficient storage bottles will enable the charging of cylinders to be effected as rapidly as filling petrol tanks, &c. In the case of 'bus services, however, the compressing station will obviously be located at depôts, and the vehicles charged with gas overnight during the garage period, and there is no reason whatsoever why there should be any loss in pay load; nor should there be loss in the case of long-distance heavy transport, provided there is a sufficiency of filling stations.

On the basis of a scheme covering West Yorkshire and Lancashire, we estimate that on present costs and charges, the maximum equivalent costs with gas at 4d. per them, inclusive of all compression charges, depreciation, filling station proprietors' profits, &c., will be equivalent to 10d. per gallon, and with gas at 6d. per therm, prime cost equivalent to petrol at 1s. per gallon. These figures are, of course, based on the use of Errenized engines. If low compression ratio self-induction engines working with a gas/air mixer are used, the figures will have to be increased by from 20% to 25%.

Mr. Masterman, in his anxiety to deprecate the use of gas, loses sight of the fact that there is, in gas undertakings throughout the country, a large surplus of gas-making plant, and, in addition, there are increasing quantities of coke oven gas that could and should be made available for the displacement of petrol and oil. The utilization of this surplus plant and gas would not necessitate the expenditure of any additional capital at the present time.

I consider, in the light of knowledge gained during the past few years, that it is our duty to make every effort to establish the use of gas for transport at the present time in the national interest, and I am certain that we shall be able to maintain that use on an economic basis when hostilities are terminated.

Yours, &c.,
W. M. CARR.

United Kingdom Gas Corporation, Ltd.,
Bridgewater House,
60, Whitworth Street,
Manchester, 1.
Jan. 6, 1940.

Tar Products

SIR,—In your interesting Note under the above heading in the issue of the "GAS JOURNAL" of Dec. 27, you say "the continuous pumping of molten pitch presents mechanical problems not yet fully solved."

We think that this statement hardly does justice to current practice. We ourselves, for instance, have been pumping molten pitch continuously with complete success for some considerable time, and have not found that the problem presents any substantial difficulties whatever.

Yours, &c.,
R. B. ROBINSON,
Director.

Midland Tar Distillers, Ltd.,
Oldbury, Birmingham.
Jan. 7, 1940.

Increased Gas Prices

SIR,—A large number of gas undertakings have increased the price of gas with varying explanations as to the cause.

In London and certain industrial centres it is explained that evacuation and general disturbances of business, and loss of consumption, in addition to increased production costs, are the reasons necessitating a substantial increase in price to consumers.

Quite frankly, I cannot see any justification for inflicting the whole of the additional cost upon the present loyal consumers. In many instances municipally controlled gas undertakings have contributed large sums from their profits for the relief of rates, the result being that in many cases non consumers have benefited instead of the consumers being given the benefit of the profit by a reduction in the price of gas.

I would ask, therefore, why should not the revenue of the gas undertaking be augmented from the general rate fund instead of the consumers being made to bear the whole of the burden?

Where the gas undertakings are company owned there should be a greater equality of sacrifice. Directors might take the initiative by agreeing to accept reduced fees or forego them, and shareholders might readily be agreeable to a reduced dividend during the crisis to conserve the financial resources of the companies, and avoid undue hardship upon their loyal consumers.

From the reports of gas undertakings generally, it would appear as though they are ever ready to make the gas consumer the "milch cow" on all occasions.

Yours, &c.,
"GAS CONSUMER."

Jan. 8, 1940.

A Comprehensive Hire and Hire-Purchase Scheme

The Severn Valley Gas Corporation and Gas Consolidation, Ltd., have put into operation a new comprehensive hire purchase and simple hire scheme.

A list of "standardized" appliances has been compiled, and suitable hire purchase and simple hire terms fixed for each type. The periods for hire purchase range up to seven years. To enable customers to transfer from simple hire to hire purchase, or cash, the following allowances are being offered:

For conversions made within 12 months ...	100%
From 12 to 24 months	75%
And thereafter	50%

Caledonian Gas Corporation, Ltd.

Appointment of Chief Executive Officer

The Directors of Caledonian Gas Corporation, Ltd., announce that the agreement between the Corporation and Close Bros., Ltd., of Clements Lane, London, E.C.4, whereby the latter undertook the functions of Secretaries, Registrars, and Managers of the Corporation has now been mutually determined.

Mr. Duncan Campbell, M.A., A.C.A., who has been Manager of the Corporation since 1938, has now been appointed Manager and Secretary. It is also announced that all transfers and communications in connexion with the shareholdings, dividends, &c., should in future be addressed to the Secretary at the Registered Offices of the Corporation, 25, Chester Street, Edinburgh.

News of the Week

During the Past Year employees of Messrs. R. and A. Main, Ltd., of Gothic Works, Falkirk, have contributed £553 to charity.

Seventy Three Applications for the post of Gas Manager have been received by the Sandwich Town Council. A short list of 12 is to receive further consideration.

Liverpool School Children are having lectures in the Gas Company's theatre at Radiant House, on domestic science subjects. The instructors are the Liverpool Gas Company's staff demonstrators, who are qualified to undertake this type of work. Each lecture is attended by 50 children.

According to a Statement in the Birmingham Chamber of Commerce Journal for December, 1939, the trade of the district indicates a brisk demand for heating stoves. Engineers in a big way who are engaged in this manufacture are not experiencing difficulty in getting permits for the supply of raw materials, it is observed, but they face the handicap of long-dated deliveries.

The Next Meeting of the London and Southern District Junior Gas Association will be held at Gas Industry House, 1, Grosvenor Place, on Saturday next, Jan. 13, at 3 p.m. There will be a general discussion on topics of interest to those whose duties are "off the works." It is hoped that members concerned with distribution and utilization will make a special effort to be present.

Three Hundred Members of the staff of the Manchester Gas Department have contributed 3d. a head towards a parcel for each of the 35 men who have joined the Forces. The parcel consists of 1 Balaclava helmet, 1 scarf, razor blades and shaving cream, chocolate, sweets and chewing gum, 100 cigarettes and 1 Christmas cake. The cakes were all made by the Home Service staff.

Portsmouth and Gosport Housewives are appreciating the war-time cookery lectures and demonstrations which have been arranged to take place on two days each week by the Gas Company. Food rationing will bring many difficulties to the housewife, but the staff demonstrators are giving valuable advice on how to serve well-balanced meals in face of restriction of certain foods.

No Increase in the Price of Gas is to be made for the time being at Tayport. Presenting the half-yearly report on the Gas Department, Convenor Garvie observed that, in common with all other gas undertakings, Tayport had to contend with reduced output as a result of the blackout. In addition, a reduction in the price of gas of 5d. per 1,000 cu.ft. decided upon prior to the outbreak of war had been in operation during the period. On the other hand, domestic consumption and sales of by-products had been well maintained, and by stringent economy a small surplus was shown at credit of the net revenue account.

A Certain R.A.F. Camp "somewhere in the north of England" were unfortunate enough to have no gas for cooking, and when it came to Christmas Cakes the real difficulty arose. However, information as to the activities of the "Home Service" Section of the local gas undertaking reached the Camp, and on Dec. 19 an R.A.F. lorry stopped at the gas showrooms and deposited several enormous packages containing butter, sugar, eggs, flour, fruit, and a bottle of sherry. On Dec. 23 the R.A.F. lorry returned to the gas showroom—and this time collected seven giant Christmas Cakes, one of which bore a beautiful iced crest of the R.A.F. So the Camp had their Christmas Cakes after all.

The Make of Gas at Stockton during November was almost 58½ million cu.ft.—a decrease of 13.49% compared with a year ago. The Engineer and Manager (Mr. F. L. Scaife) has reported that the increase in the price of coal would add approximately £1,200 to the expenditure of the undertaking for the current financial year. Commenting on the sales, Mr. Scaife stated that despite the adverse effects on output caused by the discontinuance of street lighting and other war conditions it was satisfactory to note the continued interest of the public in their product. In connexion with the restriction on public lighting as the result of the blackout regulations, it was decided on the recommendation of a joint sub-committee of the Highway and Power Committees that payment at the rate of £1,650 per annum be made to the Highways Committee in respect of the gas undertaking.

The Blackburn Royal Infirmary is to benefit by a contribution of £31 10s. from the Gas Department.

A New Vertical Retort Installation, estimated to cost £57,000, has been sanctioned at Birkenhead.

For the Installation of water gas plant, the Colwyn Bay Gas Department have obtained the consent of the Minister of Health to borrow £5,166

Among the Towns making an early start on the provision of low intensity street lighting is Burnley, whose Town Council have ordered over nine hundred of the special units for the use of the Gas Department.

Total Applications for the Barnet District Gas and Water Company's issue of £50,000 of 5% Redeemable Preference stock, 1950, totalled £430,200, at prices ranging from £110 down to minimum of par. The lowest price receiving allotment was £104 10s. 6d. at which the allotment was about 22%. The average price realized was £105 2s. 2d. per £100 stock.

In Order to Suit the Convenience of the local housewives, whose breadwinners are largely employed in the coal-mining industry, the Prestonpans District Gas Company, Ltd., held a series of "evenings only" cookery demonstrations in their showrooms at Prestonpans and Tranent on successive weeks in December. The lectures began at 7.30 each evening, and, despite the black-out, good attendances were recorded. Menus suitable for war-time cooking were demonstrated by Miss M. K. Gompertz, of R. & A. Main, Ltd.

A New Direction (Direction No. 1 under the Control of Timber (No. 7) Order) issued by the Ministry of Supply empowers any local authority and any public utility undertaking without licence to consume timber "for urgent repair work for the purpose of that authority or undertaking" in the United Kingdom. Similar freedom from licensing requirements is also extended to colliery undertakings for any purpose and to railway wagon builders and repairers for the repair or renewal of any railway wagon to be used in the United Kingdom. The Direction came into force on Jan. 1.

Armour Institute of Technology, in co-operation with seven middle western universities and colleges and several local and national technical societies, is again sponsoring the annual Mid-West Power Conference to be held in Chicago on April 9 and 10, under the direction of Mr. Stanton E. Winston, Associate Professor of Mechanical Engineering at the Institute. The purpose of the Conference is to offer an opportunity for all persons interested in power production, transmission, or consumption to meet together annually for the study of mutual problems free from the restrictions of required memberships in technical or social organizations.

It was Reported to a meeting of the Cheadle Rural District Council on Dec. 29 that a letter had been received from the Board of Trade intimating that their Special Order for the transfer of the gas undertaking to Gas Consolidation, Ltd., would be expedited, and in all probability would be approved by Parliament before March 31 next, so that the transfer would take place on April 1, 1940. The Gas Committee interviewed Mr. S. G. Wood, a Director of Gas Consolidation, Ltd., who applied for permission of the Committee to take an active part in the management of the gas undertaking, particularly from the manufacturing aspect of the business. This was agreed to.

While Excavating for an air-raid shelter at the Wakefield Gas-Works, a quern, believed to date from the neolithic period, was discovered at a depth of about 4 ft. Mr. L. G. Artist (Sewage Works Manager and Chemist for the Wakefield Corporation) first recognized it, while Mr. E. I. Musgrave (Director of the City Art Gallery and Museum) identified it as a fine specimen of the neolithic period, which in Britain began about ten thousand years ago and continued until the Roman invasion. The querns were all made from millstone grit and were shaped with the aid of flint tools. The tool marks are still to be seen in this specimen. The quern was used for the purpose of grinding corn; a wooden handle was inserted in the hole in the side for the purpose of giving a rotary movement which ground the corn between the upper and lower stones after it had passed through the small hole in the base of the conical interior of the quern.

Gas for Traction

THE standardization of the filling connexion for fabric gas bags has had the attention of many engineers in the Gas Industry and already certain difficulties have occurred where vehicles have attempted to obtain a refill, only to find that the filling point to the gas bag is of a different size from that on the standpipe of the garage or local gas undertaking, and various fittings or pieces of rubber tube have had to be found at a moment's notice, which is not always easy, particularly after dark.

This problem, apparently, also presented itself during the last war, and many difficulties arose, not only in different towns throughout the country but within the same towns and often within the area of the same gas undertaking, as seemingly it depended entirely on the automobile engineer as to what filling connexion he adopted when fixing the bag to the vehicle.

This matter was considered by the Industrial Gas Centres Committee at Gas Industry House, and a number of designs were submitted, the Committee finally approving the filling valve as shown in the illustration (Fig. 1). A type of valve incorporating a bayonet connexion was put forward but was rejected by the Committee owing to certain disadvantages.

The valve is known as the I.G.C.C. Approved Type Filling Valve and consists essentially of three parts: The base into which a 2 in. British Standard Pipe Thread is incorporated, the non-return valve and the top section, which is fitted with the 2 in. connexion from the filling valve to the bag, and a 1¼ in. connexion from the filling point to the gas carburetter.

The 2 in. B.S.P. thread connexion, to which is attached the filling pipe union or the brass cap as shown in the illustration, is made reversible so that should the thread become unduly worn it can easily be reversed or replaced with a new bush.

The top portion of the filling valve is made so that by removing the screws as shown, the outlet connexion to the carburetter can be adjusted to a number of different angles.

The resistance to the gas flow through this filling valve is 0.25 in. W.G. when passing gas at the rate of 2,000 cu.ft. per hour, which is considerably lower than the resistance of many of the valves and cocks which have already been used by a number of automobile engineers, who are not always familiar with the need for keeping the resistance down to an absolute minimum.

The 1¼ in. carburetter connexion has been decided upon, although it is well known that it depends somewhat on the type of carburetter fitted whether this size is required for small engines, but, generally speaking, it has been found that the gas supply to the carburetter should be as large as practicable, particularly on the smaller engines.

The actual position of the filling valve, whether it be at the rear nearside of the vehicle or near the engine, is, of course, a matter of choice; but with the early designs of fabric gas bag it was found that when the vehicle was in motion there was a tendency for the gas to be driven to the rear of the bag which made it necessary for the carburetter connexion to be taken from this point. With the latest designs of bag, however, this point does not arise and, therefore, the position of the take-off to the carburetter is immaterial.

In the case of large lorries and buses, the 1¼ in. carburetter connexion may need increasing up to 1½ in. to 2 in., but this minor alteration can easily be carried out by the automobile engineer or the actual manufacturer of the filling valve.

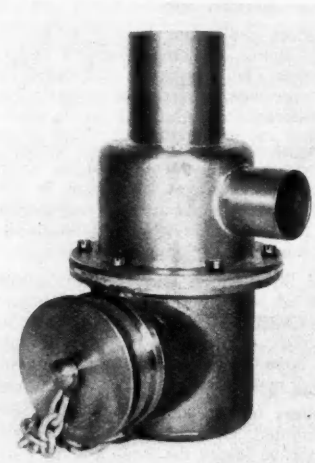


Fig. 1

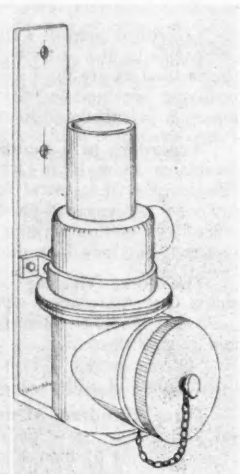


Fig. 2

Fig. 2 shows one suggested method of fixing the filling valve which, of course, can be modified to suit the particular conditions.

These valves can at present be obtained from Messrs. Wm. Sugg & Co., Ltd., Ranelagh Works, Chapter Street, S.W.1, and Messrs. Evered & Co., Ltd., Surrey Works, Smethwick. Full working drawings can be obtained from the Industrial Gas Information Bureau, Gas Industry House, 1, Grosvenor Place, S.W.1, price 1s. 6d. post free, by any automobile engineers who wish to manufacture these valves themselves, although it is anticipated that they could be obtained more cheaply from either of the firms mentioned.

Cambridge Lorry Driven by Gas

By adapting one of their coke lorries to run on gas, the Cambridge University and Town Gas Light Company have directed attention locally to the possibilities of this alternative fuel, when petrol is rationed and increasing in price.

After the initial expense has been met, the Cambridge Company have found that the running costs are slightly more than half those of petrol, while the engine runs more smoothly. Since there is no dilution of oil, without reducing its lubricating value, wear is reduced and carbon deposit lessened.

As will be seen in the accompanying photograph, the gas for the Cambridge lorry is carried in a canvas and rubber bag mounted on the top of the vehicle in a wooden cradle, which reduces chafing and provides protection. Sufficient gas is carried for 11 to 12 miles, but by introducing a second container to the trailer, the range can be increased. For filling purposes a pipe extends to chassis level, and a branch pipe connects the gas with the engine. A special gas regulator is desirable, but is not essential with all types of engine. Other features are ease of starting, and good acceleration, while in the event of the gas supply becoming exhausted, the driver can change over to petrol without leaving his seat.

Should the demand justify it, the Cambridge Company are prepared to provide a number of filling points within their area of supply.

Further Price Increases

In addition to the increases in the price of gas by various undertakings, referred to already in these columns, the undermentioned advances have also been announced:

Belfast.—By 2d. per 1,000 cu.ft.
Coalville.—By 2½d. per 1,000 cu.ft.
Dalry.—By 5d. per 1,000 cu.ft.
Girvan.—By 7½d. per 1,000 cu.ft. to 6s. 8d. per thousand.
Greenock.—By 3d. per 1,000 cu.ft. to private consumers.
Hastings.—By 1.4d. per therm (6.44d. per 1,000 cu.ft.).
Hinckley.—By ¼d. per therm for central heating and steam-raising; and by 1d. per therm for the first 500,000 cu.ft. and ¼d. per therm for quantities in excess of this figure for gas engines.
Kilwinning.—By 5d. per 1,000 cu.ft.
Lincoln.—By 3d. per 1,000 cu.ft. Industrial rate automatically increased by coal clause.
Oldbury.—By 4d. per 1,000 cu.ft.
Smethwick.—By 5d. per 1,000 cu.ft.
Stourport.—By 1.2d. per therm (5.4d. per 1,000 cu.ft.).
Wolverhampton.—By 5d. per 1,000 cu.ft.

INSTITUTION OF GAS ENGINEERS

We published last week the written Contributions to the discussions on the Institution Communications which, had it not been for the war, would have been presented last November. To-day we give the Authors' Replies.

Communication No. 222—The Influence of Pressure upon the Water Gas and Other Equilibria—by G. Sartori and D. M. Newitt, M.C., D.Sc.

Dr. D. M. Newitt: The Authors are in full agreement with the remarks of Professor Townend and Dr. Dent.

Dr. Dent has called attention to the desirability of having experimental data for the equilibrium constants of the water-gas reaction at higher temperatures than those included in the Paper, and the same remark would apply to the methane-steam reaction. Further work on these lines has, in fact, been in progress for some time, but has had, temporarily, to be suspended.

With regard to the last paragraph of Dr. Dent's contribution, curves (1) and (2) were constructed from the results of experiments in which the initial mixture contained hydrogen in slight excess of that demanded by the stochiometric equation. While, therefore, they may be compared one with another, they must not be compared with the (CH_4+H_2O) isotherm in which there is no foreign gas present.

Communication No. 223—Some Observations on the Combustion Characteristics of Town Gas and its Constituents—by G. H. Fuidge, B.Sc., W. O. Murch, M.Sc., A.I.C., and B. Pleasance.

The Authors, in reply, wrote: The Authors wish to thank the contributors to the Discussion, which they feel is indicative of the interest being taken by the Industry in this subject. They are interested to learn that both Mr. Hawes and Mr. Wood have carried out work along similar lines.

In making the statement referred to by Mr. Pearson, that different gases have different air-injecting properties, it was intended to convey that the air-gas ratios given under standard conditions varied. The Authors' results agree with Mr. J. G. Clark's findings that the volume of air entrained is independent of the specific gravity of the gas. In fact, this follows from the work of other investigators referred to in the Paper, which showed that the air-gas ratio is proportional to $\sqrt{d}$. and the volume of gas discharged is inversely proportional to $\sqrt{d}$.

It is fully realized that the mode of combustion at the head of a Bunsen burner is greatly affected by a number of factors, particularly the design of the burner, and, as Mr. Wood points out, this to some extent limits the value of the diagrams. It is not suggested that the information provided by the diagrams represents fundamental characteristics of the gases, but it is believed that it is relative and that diagrams obtained with other types of burner would bear approximately the same relationship to each other as those given in the Paper. It is probable that, as Professor Townend remarks, the effect of the burner will be quantitative rather than qualitative. On the other hand, as the results of Mr. Hawes' experiments show, certain parts of the combustion diagram may be changed in character by alteration in the design of burner. It is the intention of the Authors to examine this point further by obtaining comparative diagrams with typical commercial burners. The difference between the simple tube burner used in the Authors' experiments and commercial burners probably provides the answer to the question asked by Mr. Minchin regarding the back-firing zones in diagrams 23-26. Owing to inefficient mixing and turbulence of the primary air-gas mixture, commercial burners give much larger back-firing zones than those shown in the diagrams (Cf. p. 10 of the Paper), so that the combustion conditions often correspond to the area lying between the luminous zone and the back-firing zone. Under these conditions back-firing may result from an increase in aeration.

Mr. Wood suggests that the diagrams cannot be used to predict the behaviour of different gases in a burner having fixed gas and air ports. The Authors would point out that an attempt to make such a prediction appears on p. 41 of the Paper.

As Mr. Hawes points out, an explanation of the anomalous behaviour of certain of the mixtures, particularly carbon monoxide-methane mixtures, will no doubt be found in the fundamental work on flames which has been carried out by Professor Townend and his associates and which is being continued at Leeds University.

In connexion with Figure 19, Mr. Wood points out that the method of expressing gas rates thermally has certain disadvantages; while this may be the case when one is considering the more fundamental principles underlying the diagrams, from the point of view of the value of the diagrams to the Gas Industry the thermal units are more useful. The fact mentioned by Mr. Wood that back-firing occurs at little more than half the theoretical air-gas ratio, does not seem to have any connexion with the relationship shown in Figure 20, which merely indicates that there is a broad relation between the position of the apex of the back-firing zone and the maximum flame-speed of the gas with air. The dependence of the shape of the back-firing zone on the flame-speed air-gas ratio curves is emphasized in the interesting deductions made by Mr. Minchin in his contribution.

Both Professor Townend and Mr. Hawes have questioned whether there can be any "best" type of gas as regards combustion characteristics and have rightly indicated that gases can be burned in other types of burner than the Bunsen burner. A change in this direction is perhaps already occurring in the Industry; unaerated burners which are likely to be less sensitive to changes in composition than Bunsen burners are being used in appliances to an increasing extent. At the present time, however, the aerated flame produced by the Bunsen principle remains the basic method of utilizing town gas. It is agreed that burners could no doubt be designed for any type of combustible gas and it is believed that the combustion diagram would be of some assistance in this task. Even when used in a correctly designed burner different types of gas are not of equal merit and differ in their tolerance both to changes in composition and to minor variations in burner construction. Some indication of this tolerance can be deduced from the combustion diagrams.

Mr. Minchin correctly points out that the phenomenon of flames blowing off the burner head is not completely explained by a high mixture velocity relative to flame-speed and the subject is certainly worthy of a more detailed study. Nevertheless, in the area round the letter F in Figure 1 referred to by Mr. Minchin, the flame-speed is low, due to insufficiency of air, and although the rate of combustion in the interior of the flame is low, further combustion occurs when the gas meets the surrounding secondary air. Gas to which no primary air is added and in which the flame-speed is nil, burns entirely in the zone where the gas diffuses into the secondary air. The low flame-speed at which the phenomenon of "blowing-off" occurs is due to the presence of excess primary air or other diluent.

Since the publication of the Paper, an attempt has been made to establish a relationship between the combustion and aeration diagrams and the A.T.B. Number. As Mr. Minchin remarks, it is necessary for this purpose to include cone-height lines in the diagrams. These were omitted from the Paper to avoid complication. Figure A is the diagram for gas B (see Figure 24 of the Paper) with lines of constant cone height included. To avoid confusion, the aeration grid has been omitted with the exception of the pair of lines representing orifice No. 2 and 2 in. pressure.

The A.T.B. Number is a measure of the air slide opening

necessary to give, in a burner having a standard orifice at a fixed pressure, a flame having a standard cone height. If the air inlet were unrestricted—*i.e.*, the air slide fully open—it is to be expected that the air-gas ratio would approximate to that given in the aeration diagram for the appropriate

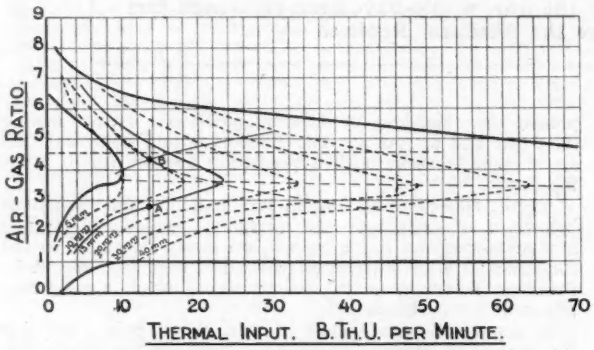


Fig. A.—Combustion and Aeration Diagrams for Gas B with Cone Height Contours added

pressure and orifice size in relation to the diameter of the burner tube.

In operating the Aeration Test Burner, the air slide is only opened sufficiently to give the standard cone height. It appeared, therefore, that if a vertical line were drawn on the diagram passing through the point representing the appropriate pressure and orifice, the relationship between the air-gas ratio at the standard cone height (A in Figure A) and that given by the orifice with unrestricted air (B in Figure A) would be approximately proportional to the A.T.B. Number.

The Aeration Test Burner model A has an orifice 0.95 mm. in diameter and operates at 2.5 in. pressure ; the burner tube has a diameter of 0.404 in. (10.26 mm.) and the standard cone height is 0.75 in., which is 1.85 times the diameter. The burner used in the Authors' experiments has a diameter of 7 mm. and the corresponding cone height is, therefore, 13 mm. Observations were not made at 2.5 in. pressure but approximately the same gas discharge per unit of burner area as in the A.T.B. Burner is given by orifice No. 2 at 2 in. pressure.

The relationship between the air-gas ratio given by orifice No. 2 at 2 in. pressure and the air-gas ratio for 13 mm. cone height at the same gas input has been determined for a number of gases of 500 B.Th.U. and compared with the A.T.B. Number. The gases tested include the four gases A, B, C, and D, discussed in Section VIII of the Paper and also a number of ternary mixtures of carbon monoxide, hydrogen, methane, and ethylene. The results are plotted in Figure B and it will be seen that with one or two exceptions the points are reasonably close to a straight line which passes through the origin, and from the slope of this line it is possible to deduce that the A.T.B. Number $= 111 \times R$ (approximately), where $R = \frac{\text{air-gas ratio at 14 mm. cone}}{\text{air-gas ratio orifice No. 2 at 2 in. pressure.}}$

Having established this broad relationship, it is interesting to ascertain to what extent the combustion characteristics as represented by the combustion and aeration diagrams are proportional to the A.T.B. Numbers. In Table 1, therefore, certain of the data given in Table 5 of the Paper, together with observations made from the diagrams similar to those given on pp. 40 and 41, are tabulated together with A.T.B. Numbers. Consideration of this table suggests that for these gases the A.T.B. Number gives a good indication of the tendency of the gas to back fire, a fair measure of the degree of aeration given in a burner with fixed air and gas ports, but has no relation to the tendency of the gas to blow off the burner head at high pressures or with the tendency of the gas to give luminous flames under conditions of restricted primary air. Since the chief difficulties of utilization which result from changes in combustion characteristics arise from back-firing, these results add further weight to the view expressed in the 44th Report of the Joint Research Committee that the Aeration Test Burner is a useful instrument for works

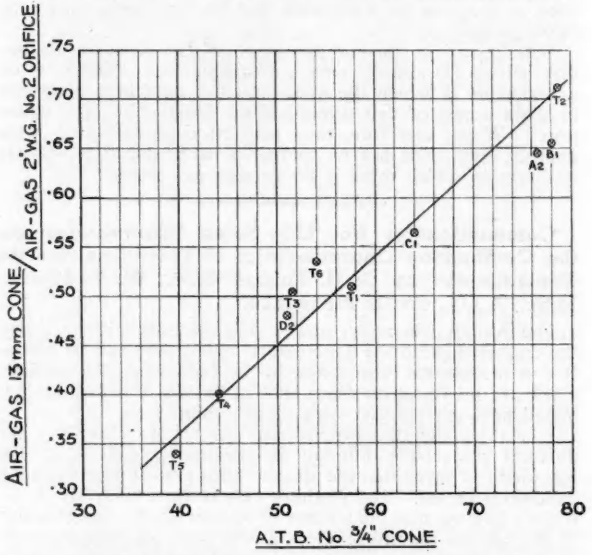


Fig. B.—Relationship between A.T.B. number and ratio R, deduced from Aeration and Combustion Diagrams

control purposes, although they show that all the properties of the gas do not follow the A.T.B. Number. The tests have, of course, been confined so far to gases of 500 B.Th.U. but it is hoped to extend the work of gases of other calorific values.

TABLE 1.

Ref. No.	Gas. Nature.	Calorific Value, B.Th.U. per cu. ft.	Density, Air = 1.	A.T.B. No. (Model A) 149.	Orifice No. 2 at 2 in. w.g. Thermal Input.	Orifice No. 2 at 2 in. w.g. Relative Aeration for 13 mm. Cone R.	Deduction from Diagrams. Liability to Fire Back.	Degree of Aeration in Standard Burner. Orifices Giving Over-Aeration.	Degree of Aeration in Standard Burner. Orifices Giving Under-Aeration.	Liability to Blow Off.	Liability to give Luminous Flame.
1	2	3	4	5	6	7	8	9	10	11	12
T_2	CO 17.9, CH_4 25.8, H_2 54.1 ...	492	0.382	78.5	15.4	0.713	2	2.5	4.5	<0.1	0.34
B_2	Horizontal	500	0.543	78.0	13.9	0.655	2	3	4	0.17	1.05
A_2	Continuous vertical	509	0.407	76.5	14.9	0.645	2	3	4	<0.1	0.75
C1	Debenzolized horizontal + 40 per cent. C.W.G.	497	0.527	64.0	13.9	0.569	3	4	3	0.57	1.00
T1	CO 37.7, CH_4 27.2, H_2 33.4 ...	504	0.569	57.5	13.3	0.51	3	4	3	0.62	0.20
T6	CO 21.5, C_2H_4 15.2, H_2 62.2 ...	505	0.408	54.0	16.6	0.535	3	3	4	<0.1	1.15
T3	CO 53.4, CH_4 25.5, H_2 19.7 ...	489	0.698	51.5	12.5	0.505	3+	5	2	2.0	0.3
D2	C.W.G.	494	0.637	51.0	13.2	0.479	3+	5	2	0.53	0.85
T4	CO 41.7, C_2H_4 15.8, H_2 40.8 ...	510	0.593	44.0	13.4	0.40	4	4.5	2.5	0.18	0.97
T5	CO 62.3, C_2H_4 15.7, H_2 20.6 ...	509	0.774	39.5	12.2	0.339	6	6.5	0.5	0.81	0.93

Explanations of Columns 8—12.

Column 8 Gives the number of orifice curves passing into the firing-back zone.
9 Gives the number of orifice curves above the minimum cone height line at a thermal input of 30 B.Th.U. per min.
10 Gives the number of orifice curves below the minimum cone height line.
11 Is a number calculated from the pressures at which the various orifice curves meet the blowing-off limit.
12 Is the air–gas ratio at the limit of the zone of luminous flame.

Post-War Fuel Policy

By

Dr. G. E. Foxwell

(*Concluded from page 30 of last week's* "JOURNAL")

The Oil Industry

THE oil industry, like most industries, originated in a simple form and became more complex as research opened new paths for the technologists. Up to 1912 the petroleum which was obtained in crude form from the earth was distilled and purified and the products were sold as "straight-run" oils; the natural gas was largely wasted, though the natural gas industry of America utilized large quantities. The rise of the motor-driven vehicle which began in earnest about this period brought with it new problems. The following table gives some figures in illustration of this:

Year.	No. of motor vehicles registered. U.S.A.	Great Britain.
1913	—	208,000
1914	1,711,339	—
1919	7,596,503	—
1922	—	498,000
1926	—	918,000
1927	23,302,668	—
1935	—	1,871,000

These figures indicate rightly that the major problem of the oil industry after the last war was to produce sufficient fuel for the automobile industry at a reasonable price. Before the war the only way to do this would have been to produce correspondingly larger quantities of crude oil in order to make the additional amounts of straight-run gasoline. If this had been the only method that could be adopted the U.S.A. oil industry would have had to produce at least twice as much oil in 1927 as it actually produced, and "the price of crude oil and gasoline in the U.S.A. would now (*i.e.*, in 1928) be soaring to famine heights and the consumer in Great Britain would probably be paying more than 3s. a gallon for petrol exclusive of tax." (E. H. Davenport, Trans. World Power Conf., 1928, Vol. I, 535.) What actually happened was that the amount of gasoline (petrol) made per unit of crude oil raised increased as follows:

Year.	Per cent.
1899	13.7
1914	18.2
1919	25.9
1927	36.7

This change was accomplished by the introduction of the two processes of cracking heavier oils and of manufacturing gasoline from the natural gas. This was the major problem of the post-war oil industry and its solution. The oil industry did not suffer from the general depression quite as other industries did. It had its own problems which it solved scientifically.

Another major problem was the dissipation of resources by unregulated drilling of wells. This problem, too, has been solved. The result of the vast over-production which was prevalent after the war was a drastic lowering of prices to an unremunerative limit. The lesson had to be learned, as it may have to be learned in the coke industry, that it is fatal to produce unregulated quantities of a product and to unload it in unregulated quantities upon a restricted market.

By-Products of Petroleum

The developments of the oil industry have not stopped with the solution of the problem of getting more gasoline out of a ton of crude oil. It was said prophetically in 1928 at the World Power Conference that there were already indications of great developments pending in the direction of the manufacture from petroleum of many products which, though not fuel, would have their effect in reducing fuel prices; the vast quantities of natural gas which were wasted would in the near future find new applications as basic materials for the manufacture of valuable products such as formaldehyde, alcohols, &c.; the gases from the cracking process would furnish alcohols, glycols, and a multitude of products which could readily be made from the reactive unsaturated hydrocarbons. To-day the traditional lack of reactivity of the paraffins is being overcome by their conversion into olifines or by reactions of the paraffins with olefines. Thus from petroleum and from natural gas new and valuable products are being produced and the petroleum industry is becoming a huge synthetic chemical industry. As a branch of these developments, there has been an ever-increasing standard of petrol as expressed by its octane number. Included in this is that striking series of reactions by which iso-butylene derived from cracking heavier fractions is converted into tertiary butyl alcohol by absorption in cold sulphuric acid; on warming, liquid di-isobutylene separates, which is subsequently hydrogenated to iso-octane. Thus the substance originally used as the standard of a superlatively good petrol itself becomes available as petrol, thereby leading to striking developments in the design of the internal combustion engine.

The scientific and technical developments of the oil industry during the post-war years has been described in some detail to indicate that the oil industry is powerfully organized and is equipped scientifically and technically to meet whatever problems are put before it. Those who would displace the products of petroleum in the internal combustion engine have before them a very hard fight which, it seems, cannot be won except by weighting the scales with Government aid in the form of taxation. Should that aid be applied?

There we are on highly debateable ground in respect to what our post-war policy should be. There are those who declare roundly that oil should not be allowed to compete with home-produced coal; we have seen that this is a one-sided view which neglects the many repercussions of the oil industry of the interests of British capital and British labour. A glance at the trend of oil imports into this country is illuminating.

Year.	Motor spirit. Tons.	Total of all oils. Tons.
1913	336,193	1,817,844
1920	689,702	3,310,587
1925	1,349,447	6,118,567
1930	3,182,031	8,861,062
1933	3,577,047	8,962,156
1935	4,103,450	10,265,237
1937	4,762,000 (?)	11,240,000 (?)

The figures for 1937 are approximate, but nearly correct. It will be seen that over the post-war period of 1920-1937, a period which includes years of deep industrial depression as well as periods of good trade, the average annual increase in petrol importation has been 240,000 tons, and for all petroleum products the annual increase has been 465,000 tons, the increase for the last few years being somewhat greater than this. The importance of the oil industry is such that it would appear impolitic, to use a mild term, to attempt to replace petroleum products wholesale by expensive oil from coal, or even by the cheaper fuels gas and solid fuel in traction gas producers. One day when the world's oil supplies have become more nearly exhausted than they are to-day, these steps will be necessary and will become economically logicial.

It must be realized, moreover, that the petroleum industry is beginning to supply liquid fuels of a very high grade which cannot at present be obtained from other sources. The rôle of imported petroleum will probably tend more and more in the direction of supplying high-grade spirit for aeroplane work or for lighter cars and for specialized purposes, together with the chemical products to which reference has been made; its orientation will change. The "rough work" of traction, the work of driving heavy lorries, buses, and similar vehicles may well be left to solid fuel in producers, and even possibly to coal gas. Would it not adequately safeguard all interests as well as provide logical development if the annual importation of oils were stabilized at approximately the present figure, the annual increase being ear-marked for home-produced fuels?

It would be a tough proposition for the carbonizing industries to look after even that modest annual requirement for coke. It has been calculated that the amount of anthracite available for traction in gas producers is between 250,000 tons and 500,000 tons a year. This is a stable figure which would not be subject to an annual increment; the rest must be made up with manufactured fuel. Before we can think of vast gas producer programmes, the fuel must be available. Should we not take a leaf out of the oil industry's book and solve our problems by research? Should not the Gas Industry and the coke oven industry combine to design a gas producer for traction purposes which can use fuels now produced by high temperature carbonization, or, if that proves impossible, to devise means of producing the necessary fuels, by activation or otherwise, in gas-works and coke ovens? The problem of providing the fuel for such a programme would be not a light one. If only the annual increase of the petrol imports were replaced by coke, we should need some 575,000 tons of *additional* coke for the purpose each year; if all the increased oil importation was so replaced the annual increment of coke sales would be over 1,100,000 tons. Since only a portion of the heavier oil is used as Diesel oil for road purposes, the actual figure will be between these extremes. These figures show at once the importance of the problem, and its difficulty. This difficulty is enhanced when it is remembered that only small fuel

graded between very narrow limits (*e.g.*, ⅜ in.-½ in.) is satisfactory for the producers in use to-day.

In the same way, there are many of the rougher uses of petroleum such as fuel for central heating or steam raising which could with advantage be replaced by coke, and in view of the almost inevitable increase in aviation after this present war, an extension of the replacement of oil by coke for these purposes would probably leave the total quantity of imported oil unchanged.

Electricity

After the last war, the electricity industry found itself growing in stature, but—in the opinion of authorities—hampered by the relatively high operating costs of the numerous generating stations then existing, this being partly due to the uneconomic load factor. In addition, there were vast areas in the country which had no electrical supplies but in which it was believed electricity would find a ready use if it were made available. In addition, there was a belief widely held among pseudo-scientists, that in the scientific age that had just dawned no other source of heat and energy could be considered for a moment as being on the same plane as electricity. That electricity was not available in every quarter of the country was held to be a grave handicap to British industry and the British farmer. In 1926, the country was divided by electricity undertakings into some 600 areas for distribution purposes in which there were no fewer than 482 generating stations, for the most part run as self-contained entities producing their own current and distributing it to the public; the average size of the generating station was no more than 10,000 kW. and 75% was under 5,000 kW.

With the intention of increasing the availability of electricity and of decreasing its cost of production, the Government sponsored the Electricity Grid in 1926. To a large extent both objects have been achieved. There is no doubt that bulk generation of electricity, and in particular the construction of really modern plant, has brought important economies, and it is just those economies, as we have seen, that have caused difficulties in the coal industry. In the years immediately before the inception of the grid, the 482 stations had (*e.g.*, in 1925-6) a coal consumption of 2.4 lb. per unit of current; by 1932 it was down to 1¼ lb.; by 1937 to 1.51 lb., the great Battersea station leading the way with a consumption as low as 0.94 lb., and the Fulham station coming next with 1.04 lb.

Nevertheless, it must be borne in mind that although many old stations had been closed and a few modern installations erected, there were still 424 generating stations in 1937. Evidently the improvement has been due to general modernization, but more probably to the over-riding effect of a few very large modern installations. Although the average for 1937 was 1.51 lb. of coal per unit, only 28 stations were below 1.5 lb. This result has been achieved by huge capital expenditure—the construction of the grid alone cost some £27,000,000—and it does not appear to have had any marked effect upon the cost of distribution or of other expenses. In point of fact the electricity industry is waiting to-day to see what the Government proposes to do to reorganize the power distribution of the country. It has been remarked that "it was the 1914-18 war that eventually brought about a change in our system of generation; perhaps the present hostilities will do the same for distribution." The demand for electricity is growing, however, and over the five years 1930-35 there was an increase of 19.4% in industrial production, of 4.8% for railways and tramways, and of no less than 61% from authorized undertakings; during 1936-37 the increase from authorized undertakings was 11%, and in 1937-38 it was 8.3%. It is worth recording that the total output of 25.284 million kW for 1937-38 on a basis of 1 unit to 3,413 B.Th.U. only amounts to 866 million therms or about half that of the Gas Industry.

Town Gas

It is unnecessary here to make any extended review of the position of the town gas industry after the 1914-18 war, but a few points must be made for the sake of completeness. The gas engineer of 30 years ago would no doubt consider that he had to sell gas against competition. Had there been any seer able to look into the future, he might have remarked to that gas engineer in the idiom of the future: "Say, you ain't seen nothing yet." Competition as we know it to-day arose immediately after the last war with the rise of the popular misconception that the Gas Industry was old-fashioned, obsolete, and could not long exist in the face of the new and vigorous power, electricity. The difficulty of the situation was that popular feeling was right in describing the Gas Industry as old-fashioned. When the history of the Gas Industry comes to be written, it will surely be made evident that the past 20 years have been among the most remarkable experienced by any industry. In appliances, in plant, and in methods the Industry has rejuvenated itself. Its apparent lack of progress measured in terms of output was due to the replacement of obsolete fuel-wasting appliances by modern appliances. Even to-day one hears murmurs of the old attitude in the belief—now surely dying out—among the οἱ πολλοί that it is not in the interest of the Gas Industry to provide efficient methods of utilizing gas. During the period which we are considering, therefore, we have seen a complete revolution in appliances (a revolution not yet completed), an equal revolution in sales methods, the development of industrial gas and of industrial gas centres, the strengthening of the Industry politically by the formation of the British Gas Federation and the welding of all the sections together, so that it is united as few industries are united. Those who had the vision to bring this about have reared a monument through the renown of which, like Horace of old, they may say of themselves: "I shall not wholly die, but a great part of me shall 'scape death; continually amid posterity I shall increase anew in fame." There has also been the development of the holding company, another application of the principle of strength through unity, even though it may not invariably work out that way. The conclusion must be that the Gas Industry has used the post-war years to carve anew for itself a place in the national economic life, and has set up the organization which shall ensure that where there is a case for the use of gas, it shall not go to other fuels by default.

In the same way the carbonizing industries in general have set up marketing and control organization to ensure that they shall receive the best return from by-products, this movement being brought about in the first place by the removal of ammonia from the list of profitable by-products.

Some Conclusions

What, then, is likely to happen in the post-war fuel industries, and in what direction should we endeavour to guide events? We cannot control events, but we can work in the attempt to make events take a sound and practicable course. In the foregoing account of the fuel industries certain principles and proposals have been indicated, being left, perhaps, like loose ends that may now be gathered up. The principles which may guide us appear to be capable of summarizing as follows:

(1) This country has only one indigenous fuel—coal. This is so vital to the prosperity of most of our heavy industries that it should be used only for the national good. The coal industry must, therefore, be so organized that while giving reasonable return to owners and workmen it operates fairly towards other industries.

(2) Economically, the view should be taken that the production of coal should be regarded as public utility industry, the prices and profits being controlled in the same way as those of the gas and electric industries, always bearing in mind the distinction that a coal mine is a wasting asset.

(3) Technically it is of vital importance that coal should not be wasted. The fuel technologist has done so much in this direction since the last war that there seems little doubt that the initial difficulty of decreased output due to increased efficiency has been faced once for all.

(4) On every conceivable ground, smoke abatement must be encouraged. The production of smoke wastes our coal resources and causes enormous losses through ill-health and material corrosion. In many uses of raw coal the fuel can be burnt automatically and smokelessly. In many others the manufactured smokeless fuels, gas, coke, and electricity are preferable. There should be drastic legislation against smoke production. Many, including the writer, have felt that smoke abatement legislation could never come to pass; but the patience with which the nation accepts lighting restrictions for its safety makes one wonder whether it would not equally accept smoke restrictions for its safety and well-being, *if convinced that those restrictions are sound.*

(5) Uneconomic attempts to produce oil from coal should be considered as long-range, large-scale researches. We cannot afford to pay higher prices for oil than do other nations. Oil is an important employer of labour in this country, and since its use is increasing, the suggestion is made that the amount imported should be stabilized at about 10,000,000 tons a year, the increase being taken up by home-produced fuels if found economical.

(6) There seems to be a sound economic justification for the use of solid fuel in gas producers for traction purposes, and given suitable development this could lead to a huge outlet for manufactured cokes. Either a producer must be developed that will work on high temperature coke as we know it to-day, or coke must be specially prepared, either by activation of high-temperature coke or by greatly extending the low-temperature carbonization industry.

(7) A regulated coal industry would take advantage of modern fuel technology to level up the prices of the various sizes of coal. There seems little reason for grading the price of coal by its size if the calorific value is taken into account. The psychological factor comes into play here, and it would probably be necessary to educate the purchaser to the fact that given the right appliance all sizes of coal can be used with equal efficiency; there should be better selection of coal for the purpose and appliance in which it is used.

(8) There must be less wastage of fuel. Reference is here made to surplus coke oven gas, and similar sources of heat loss. When the coke oven industry lost ammonia, formerly its most profitable

by-product—a major disaster caused by the last war—it replaced that loss by regarding gas as its principal asset. The coke oven industry must find a profitable use for the whole of its gas. Whether sales to the Gas Industry or extensive local gas grids are the most profitable use remains to be discovered. Research such as that conducted by the petroleum industry may yet discover that useful fuels can be made from methane and hydrogen.

(9) The policy as regards coke is difficult to define. It may be that in the long view, coke is only a passing phase, that the Gas Industry within the next 20 years will have changed to total gasification under pressure, and that the growing desire of the people for convenience and cleanliness will have removed solid fuels from the domestic hearth. It may be that that will not come to pass, but that the Englishman will stick to his solid fuel indefinitely. Whichever may be true in the longest view, it is quite certain that the Gas Industry as now constituted must sell its coke at a good price in order to keep down the cost of gas. It is also certain that the coke ovens will demand an outlet for many millions of tons of coke in the domestic market. Prudence demands that the coke industry shall be organized throughout the country, both the gas and coke oven industries being equally represented. This organization was in progress before the war; let us see that it is finished before the war ends.

Elimination of Competition

(10) All fuel industries should be so ordered and governed that competition is eliminated except on the basis of the true cost of the fuel for the purpose for which it is used, always with the over-riding condition that the use should be smokeless. The cost of coal, coke, gas, and electricity, for example, should be a fair reflection of the cost of production, preparation, and distribution. Groups of users should not be allowed preferential prices at the expense of others. If a comprehensive scheme on these lines could be evolved, each user would be able to choose the fuel that he preferred (provided he used it smokelessly) and the purposes for which the various fuels would be used would sort themselves out. It would be manifestly impossible to lay down arbitrary rules permitting only certain uses for each fuel, but, given a fair price ratio, those uses would inevitably appear since the sales and development organizations of the several fuels would still be available to put forward the claims of their fuels in competition to potential users, and to develop new uses and new appliances.

(11) It may be asked who would settle the prices and who would control the fuel industries. Let it be granted that the principle is firmly adopted on a fair field and no favour. Let it be granted that this means that every fuel would be saleable at a price fixed by its cost of production, preparation, and distribution—and this would obviously allow the large user better terms than the small user—plus a reasonable profit fixed on the same lines as are gas profits so as to encourage cheaper cost of production. Granted all this, the control could be vested in a strong Government department, working under adequate safeguards and with right of appeal. The present writer is bold enough to support Colonel Bristow's suggestion made to the Fuel Luncheon Club ("GAS JOURNAL," Nov. 8, 1939) that there should be set up a Ministry of Heat, Light, and Power, which, he said, "should be the greatest and best-equipped ministry in the country." In making this suggestion Colonel Bristow rightly said that "there is an almost complete absence of national planning by the many sections of the industry." It is, in the writer's submission, no use setting up such a ministry unless we have a pretty clear idea as to how it should work. It has been the purpose of this article to survey the major fuel industries of the country and to show what changes occurred in their position after the last war in order to discover how far they are in a position to meet the problems that will arise after this war. In the course of that survey he has come to the conclusion that the policy of a Ministry of Heat, Light, and Power should be to demand smoke abatement of the country, and given that to do nothing more than ensure that each of the fuel industries shall have free economic interplay based upon real costs—*i.e.*, a fair field and no favour. The special case of industries that import fuel from abroad can be met by encouraging home production in certain directions and especially to avoid *increased* imports while leaving a reasonable trade for the imported product.

The Quality of Coke*

Reviewed by
Dr. G. E. Foxwell

THIS is not a text-book on coke quality. It is a review of the researches made under the ægis of the Midland Coke Research Association into the manufacture and preparation of coke in the by-product coke oven. Since the iron and steel industry has taken an active part in the work, it is natural that the metallurgical uses of coke, and its production for those uses, should have pride of place. There are certain sections of the book devoted to the production of coke for the general market, and perhaps the Gas Industry will be primarily interested in these pages and in the light they throw upon what is being done technically within the coking industry. The section on the mechanism of coke formation will also prove to be of general application.

The book is divided into four parts. A short introductory part touches the fringe of the subjects to be discussed, and is followed by perhaps the most important section of the book from a practical point of view dealing with the standards of a commercial coke. With what in happier times we should have termed "Teutonic thoroughness," the Authors examine minutely the various tests that are applied to coke. The size of coke, its structure, its sampling and analysis, its density and porosity, abradability, hardness, and reactivity are all brought under the scientific microscope so that in the end the Authors feel themselves able to put forward a specification for furnace coke. There is no hint yet whether this specification will receive the practical sanction of the industry, or whether, on the contrary, the industry will apply "sanctions" to the Authors for having dared so greatly as to put forward a specification.

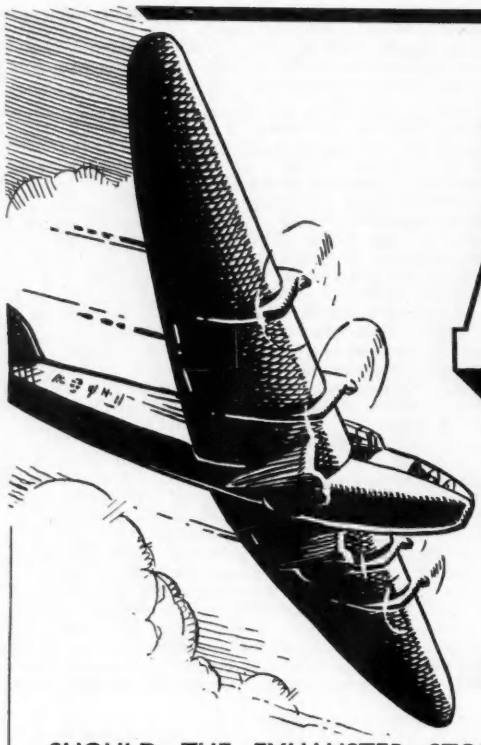
A third section, nearly 200 pages in length, is occupied by a review of the work that has been done at Sheffield and elsewhere on the formation of coke. This is a very valuable résumè of the subject for the scientific worker, though perhaps the critic might suggest that it tends to over-emphasize the part that has been played in developing these ideas by the staff at Sheffield. At least the work done at Sheffield has been of first-rate importance in producing convincing evidence that a combination of earlier ideas on the subject of coke formation has proved sound. Much of the earlier work consisted of comparatively slender experimental results which showed the way which has now been extensively developed by these researches. Part 4 is a discussion of methods of improving the quality of coke largely in the light of carbonization tests in a experimental oven of semi-scale dimensions, supported wherever possible by bulk oven tests.

There should be no doubt that this book will find its way on to the shelves of everyone interested in coal carbonization. Even though it may not for the most part be directly concerned with gas-works practice, it is nevertheless a valuable work of reference upon the behaviour of coals undergoing carbonization and upon the tests to which coke is subjected.

A few points may with advantage be selected that will be of especial interest to the gas engineer. Scientific blending of coals to produce certain desired qualities of coke is virtually unknown in the Gas Industry, and it is interesting to note that the quality of the product from a blend cannot be determined from a knowledge of the behaviour of each constituent separately. It is becoming recognized, however, that a reactive coke can be obtained by blending non-coking coals with coking coals; the statement is made that cokes from non-coking coals owe their reactivity to the fact that they do not become wetted during carbonization with tars and oils distilled during carbonization "and a protective coating of unreactive tar-carbon is not formed on the surface of the coke"; this is not a statement with which many will agree, since it is known that the structure of the char from non-coking coal is the dominant factor.

It is remarked that no standardization has yet been attempted of the sizes of oven cokes for the general maket, and examples are given showing how these sizes vary from county to county; it might well be considered by the Coke Research Committees whether standardization of size is desirable or whether standardization should not take into account the intrinsic combustibility of the coke—*i.e.*, whether the cokes should not be standardized by their behaviour in a given appliance for which they are intended to be used. Abradability affects gas coke, especially during handling, and it is shown that high ash content is not of itself a sign of high abradability. The importance of low breeze content on blast furnace operation is stressed, but

* "The Quality of Coke," by R. A. Mott and R. V. Wheeler, being the Second Report of the Midland Coke Research Committee, issued by the Iron and Steel Industrial Research Council. Chapman and Hall, 36s. net. 464 pp.



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"breeze" to the blast furnaceman appears to be all below 1¼ in. or 1¼ in. in size.

The value of high combustibility for domestic appliances is fully recognized, and several pages (156-167) are devoted to this subject. It is of interest to note that highly reactive coke can be made at high temperatures in coke ovens; on p. 162 there is reference to a "reactive oven coke" made from a blend of coking and non-coking coal and carbonized in 10 hours in 16-in. ovens, and on p. 164 to a coke (apparently the same one) referred to as "R process" coke. This coke, is thought, though the fact is not stated, to have been made by Mr. John Roberts, and it shows that an excellent material can be made at high temperatures, a fact that should encourage the industry (and the Gas Industry) to continue to experiment in that direction. More reactive cokes can be made from the poorer coking coals, and it is confirmed that these coals yield better cokes with fine grinding, "fine" being 90% through ⅛ in. The value of durain and the oft-despised fusain in improving the quality of the coke is stressed. One hopes, however, that in future work nothing more will be heard of the extraordinarily involved nomenclature—due to an "international conference"—recorded on p. 225; scientific men, and women, are apt to let their enthusiasms run away with them when nomenclature is under discussion.

It will be recognized from this description that it is impossible to do justice in a short review to the many aspects of carbonization treated in this work. It opens a wide field for discussion. As a record of researches it has peculiar value. Because it is a record of researches it is on the same basis as a scientific Paper—it is open for discussion, and the results and ideas need not necessarily be accepted until they have passed the acid test of practical trial and application. It is with a feeling of sadness that one realizes that this is the last publication to which Professor Wheeler will put his name; the profession of fuel technology and in particular the coal industry will be the poorer by his early death. His monument will be his work on the constitution of coal and upon the explosive characteristics of coal dust and other combustibles present in coal mines, and perhaps in particular the organization of the Safety-in-Mines Research work.

Advantages of the Gas Grid

The progress of the gas grid is reviewed in an article appearing in the *Sheffield Telegraph and Independent* Trade Supplement under the title of "Gas Industry and National Defence." As one of the pioneers in the application of the needs of surplus coke oven gas to the needs of industry, the Sheffield and District Gas Company can look with justifiable pride on twenty years of work in this field of enterprise.

During the period of general trade depression which was experienced some years ago there were many objections made and doubts expressed as to the wisdom of embarking on what was thought to be a costly and crazy scheme. These doubts and objections have steadily but surely been overcome, and the answer is that to-day, owing to the unqualified success of the South Yorkshire gas grid scheme, in few places in Great Britain is there such an abundant supply of gaseous fuel at so low a price to the industrial consumer as there is in the area covered by the operation of the Sheffield and District Gas Company.

In spite of much publicity, however, there are even now many people who have little or no conception of the magnitude of this coke oven gas enterprise. In addition to the service which the gas grid has rendered and is still rendering to local trade, immense benefit has accrued to the coking industry.

Since 1932 the total sales of gas recorded by the Sheffield and District Gas Company have increased by over 115%, while there is every indication that the output for 1939 will be in the region of 12,000 million cu.ft. This is a demonstration of the utility of gas for industrial purposes, and is at the same time an indication of the remarkable progress made by the gas grid scheme since its inception.

The article goes on to deal with some of the many processes which the Sheffield Company have put at the disposal of their industrial consumers with a view to improving the efficiency of their operations; and concludes with the statement that in spite of the fact that war conditions have made it necessary for the Company to apply the major portion of their energies towards supplying Sheffield industries with unlimited supplies of gas, much attention is still being devoted to ensuring that domestic consumers continue to receive the same dependable service they have always been used to.

As on previous occasions, the Company have contributed to the prestige of the Industry by securing the whole of the Supplement's front cover space for a striking display in colour with the theme "Gas Puts Quality into Sheffield Steel."

Smethwick's Gas Price

Effect of War Conditions

At the last meeting of the Smethwick Town Council the Gas Committee reported that there had been considered a report of the Gas Engineer upon the increased cost of the manufacture of gas consequent upon the rise in the price of coal and other costs, in addition to the heavy increase in the rate of income tax.

It was recommended that the price of gas be increased by 5d. per 1,000 cu.ft.

Alderman S. Smith (Chairman of the Gas Committee) told the Council that it was with very great regret that he had to ask for approval of the proposal of the Gas Committee. With the outbreak of war it was inevitable that conditions became abnormal in every direction. Among other things expenses and prices of all commodities commenced to rise. As a matter of fact, they began to feel its effects many months ago when plans had to be made for civil defence of the works and distribution services, and for the preservation, so far as possible, of an uninterrupted supply of gas in any foreseeable circumstances. During the past eighteen months the expenditure on A.R.P. had exceeded £12,000—less £4,000 grant. He said it was impossible to forecast the effects of the war on the financial position of the Undertaking very far ahead, as prices and other factors were changing so rapidly, but it was already evident that there would be a loss on next year's working unless the price of gas was increased. Even with rising costs under war conditions, it was imperative that works plant, and distribution system should be maintained in efficient condition, and the Gas Committee's view was that production and supply of gas should proceed on a sound basis in order that when hostilities ceased consumers would reap the benefit by reductions of the financial burdens at the earliest possible moment instead of being faced with an aftermath of expenditure caused by procrastination.

Alderman Smith summarized the increases budgeted for the year and mentioned that the total of £18,150 was made up by the following items: Income tax, £8,000; coal and boiler fuel, £6,400, less increases from residuals, £3,700, giving a net figure of £2,700; maintenance of plant, mains, meters, &c., £2,500; wages and allowances, £2,950. To these items had to be added £2,000, representing the reduction in profit on sales of appliances.

The Council accepted the proposal of the Gas Committee.

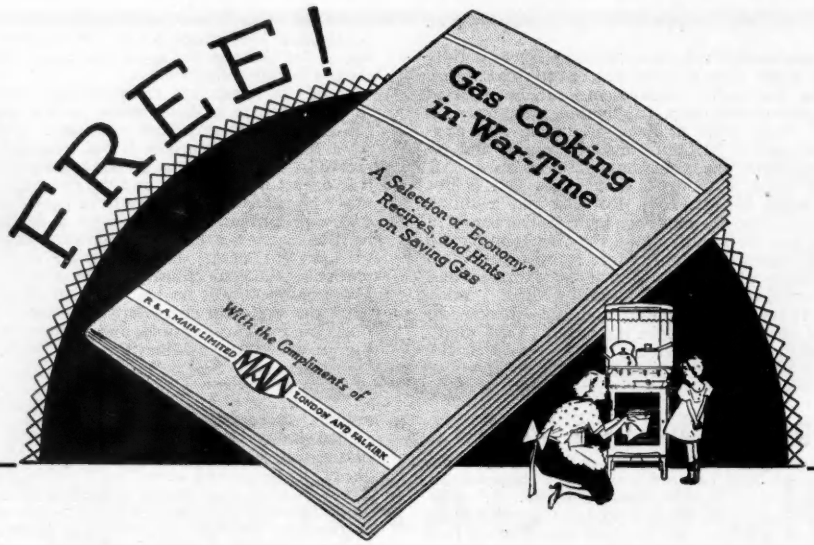
"Gasometer" in Regent Street

It is, perhaps, only fair to set our readers' minds at rest at the outset by stating that the above heading is not an indication that the Gas Light and Coke Company are engaged upon so remarkable an engineering feat in the heart of London as might at first glance be suggested.

The caption relates, in fact, to a letter which was addressed to the Editor of the *Morning Post*, on Jan. 5, 1820, by an anxious citizen who became in his apprehension so mixed in his terms as to speak of a "gasometer" when the plant in question cannot, we imagine, have been anything more unusual than an ordinary main in an underground duct. The letter, which was reproduced in the *Daily Telegraph* last Friday, ran as follows:

> "Sir—There is now building a gasometer, in Regent Street, Oxford Street, which appears to be intended for the supply of Gas for the Argyle Rooms, though, from its dimensions, it would probably supply it more extensively, the masonry of which being about 20 ft. in depth, about the same length, and of proportionate breadth, directly under the carriage-way being flung out beyond the flags.
>
> "That there is a considerable danger in the use of these gasometers frequent experience verifies; and it does appear to me, that a work of this dangerous kind ought not to be placed under the feet of those who pass over one of the greatest thoroughfares in London, which must be the case whenever Regent Street shall be finished.
>
> "I hope this notice will be duly attended to by such Parish Officers or others, whose duty it is to superintend the construction of works wherein the public safety is involved; indeed, I should not be surprised to hear, that the Insurance Offices increased the rate of insurance on houses in the immediate vicinity of the above-mentioned works."

This letter is an interesting sidelight on the mistrust which the supply of gas aroused 120 years ago. To-day it would be difficult to take many steps in any direction without walking above such plant as gave rise to the anxiety in the mind of this early correspondent. It would indeed have been a dark day for the Gas Industry had insurance companies seen fit to impose additional rates on property in the immediate vicinity of gas mains. The public nowadays take little heed of what lies beneath their feet in our thoroughfares, and the very few instances of serious mishap shows that their trust in the safety and efficiency of gas distribution systems is not misplaced.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WAR-TIME COOKERY

To help users of gas cookers to avoid waste and to adapt their menus to the changed conditions of to-day, Messrs. R. & A. Main Limited have just produced a booklet on "Gas Cooking in War-Time."

Although primarily intended for those who have cookers fitted with the Mainstat oven-heat control, the booklet is also suitable for use with any type of gas-oven, as, in addition to the appropriate Mainstat setting, the time for cooking and the heat required (a cool, moderate, or hot oven) are also given with each recipe.

With the booklet as a guide, housewives will be able further to devise economy in food, whilst the hints it gives on "Cold-Oven-Start" cookery offer considerable opportunity for saving both time and fuel.

GAS OFFICIALS ARE INVITED TO WRITE FOR SUPPLIES OF THIS BOOKLET FOR DISTRIBUTION TO CONSUMERS CALLING AT THEIR SHOWROOMS.

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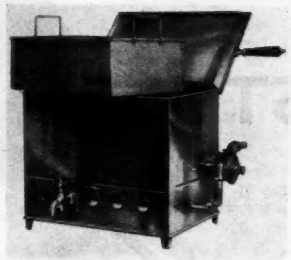
Trade News

Gas-Heated Sterilizer

The appliance illustrated in the accompanying photograph is a new gas-heated sterilizer, specially designed by Fletcher Russell, Ltd. (Radiation, Ltd.), for A.R.P. first-aid posts. Having an overall size of 15 in. by 13 in. by 10 in., the appliance is very compact and can be readily installed on a first-aid table. The gas consumption is low, being 10,800 B.Th.U./hr. (or, say, 21 cu.ft.), but further economy is effected by the introduction of thermostatic control, by means of which the water is kept just on boiling point, without the manipulation of taps, for a gas consumption of approximately 8 cu.ft./hr.



Gas-heated Sterilizer

The sterilizer itself is constructed of polished copper with hinged lid. Inside is a wire basket (14 in. by 5 in. by 9 in.) to hold the instruments; a tinned perforated copper basket can be supplied if preferred at an extra price. This basket, provided with two handles, rests on a false bottom of perforated tinned copper. When the instrument basket is removed there is ample accommodation for kidney bowls, &c. a draw-off tap is fitted. The exterior can be finished in chromium plate, if required, while the sterilizer is also available without the thermostat.

A New Bowl Heater

A gas bowl heater embodying a number of interesting features is shortly to be placed on the market by Falk Stadelmann, & Co., Ltd., of Farringdon Road, E.C.1. To be styled the "Warmglow" heater, its design was instigated at Watson House, and it will sell at an exceptionally modest price. The principle is very simple —a flat-flame burner heats a "high-speed" perforated steel element positioned in line with the diameter of the bowl, as distinct from the more usual method of projecting the element from the centre of the bowl. This element is constructed of the same material as the firm's well-known circular grill-burner used on "Newhome" cookers and "Argyll" hotplates. The diameter of the bowl is 9½ in., the reflector being of tin-plate heavily coppered and polished to give a cheerful, warming glow. As will be readily appreciated, the heating element is unbreakable, thus obviating renewals, while the flat-flame burner is stated to have an hourly consumption of 6 cu.ft. The heater is complete with wire dress guard and black sprayed steel stand.

"Denso" Award

At the recent International Water Exhibition at Liege, "Denso" —as manufactured by Winn & Coates, Ltd., of 40, Trinity Square, E.C.3—was awarded the Gold Medal.

The Ironmonger Diary and Hardware Buyers Guide, published by the *Ironmonger*, attains its 72nd year with the 1940 edition just to hand. It contains as usual a remarkably varied collection of information of value to the hardware trade, including special war-time features dealing with emergency regulations, lighting restrictions, supply departments, trading with the enemy, and war risks insurance. The buyers' guide and advertising sections, and the classified list of trade marks and brands, are an indication of the wide field covered by the directory. Four closely printed pages are devoted to a "Directory of Associations," but this apparently is not so complete as the rest of the book, for although eight other institutions are mentioned, The Institution of Gas Engineers is omitted. The Electrical Association for Women is included, but not the Women's Gas Council, nor can we find anything about the British Gas Federation, the National Gas Council, or the Gas Companies' Protection Association, although their counterparts in kindred industries are duly listed.

Institution of Gas Engineers

Tar Carpets

A limited number of copies are available of a Paper on "Tar Carpets," by G. H. Fuidge, B.Sc., which, but for the outbreak of hostilities, would have been presented through The Institution of Gas Engineers at the Public Works, Roads, and Transport Congress in November, 1939.

Copies may be obtained from the Secretary of the Institution, 1, Grosvenor Place, London, S.W.1, price 9d. each, post free.

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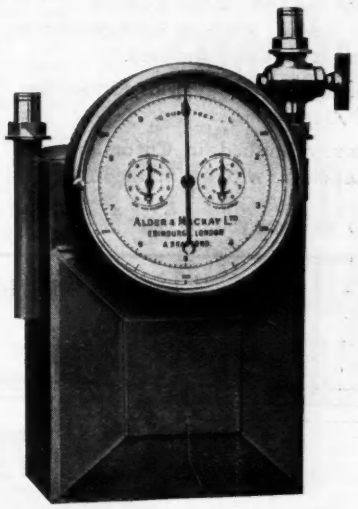

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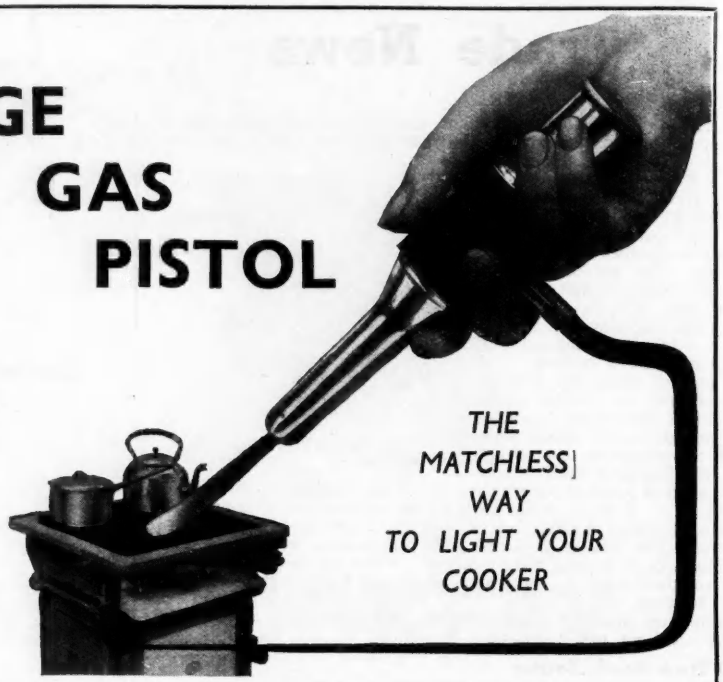

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Current Sales of Gas Products

The London Market

Jan. 8.

To-day's value of tar products in the London market are as under:

Pitch about 35s. per ton f.o.b.

Creosote about 5d. per gallon.

Refined tar 3¾d. to 4d.

Toluole is now controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material may be sold.

Pure benzole about 1s. 10d.

95/160 solvent naphtha about 1s. 11d. to 2s.

90/160 pyridine 14s. to 14s. 6d.

All per gallon naked.

Refined naphthalene crystals about £16 per ton in bags.

All *ex* makers' works.

The Provinces

Jan. 8.

Crude Gas-Works Tar, 18s. to 23s.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch—East Coast, 32s. 6d. to 35s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 32s. 6d. to 35s.* Toluole, naked, North, 1s. 9½d. (Controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 9d. to 9½d. Solvent naphtha, naked, North, 1s. 7d. to 1s. 8d. Heavy naphtha, North, 1s. 4½d. to 1s. 5½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4¾d.; Scotland, 4¾d. to 4¾d.; low gravity, 4½d. to 4¾d. Carbolic acid, 60's. 3s. to 3s. 3d. Naphthalene, £15 to £20. Salts, 75s. to 85s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil, (min. gr. 1,080), 5½d. to 5¾d.; filtered heavy oil (min. gr. 1,080), 5¾d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6¼d.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls, whatever they may be.

Scotland

GLASGOW, Jan. 6.

Owing to the holidays there has been very little activity. Prices remain unchanged.

Crude gas-works tar.—Actual value remains at round 30s. to 32s. per ton *ex* works in bulk.

Pitch.—Vertical quality is offered freely at 23s. to 24s. per ton f.o.b. for export and round 20s. to 22s. 6d. per ton *ex* works in bulk for home trade.

Refined tar.—Practically no business is being arranged and makers' prices are unchanged at 3¾d. to 4d. per gallon in the home market and about 2½d. to 2¾d. per gallon for export, both naked at makers' works.

Creosote oil.—There is a steady demand for most grades with prices as follows: Specification oil, 5d. to 5¼d. per gallon; low gravity, 5¾d. to 6d. per gallon; neutral oil, 5¼d. to 5¾d. per gallon; all *ex* works in bulk.

Cresylic acid.—Consumers are fairly well covered on contract with the result that new business is quiet. Meantime makers are maintaining prices as follows: Pale, 97/99%, 2s. 2d. to 2s. 4d. per gallon; dark, 97/99%, 1s. 10d. to 2s. per gallon; pale, 99/100%, 2s. 6d. to 2s. 9d. per gallon; all *ex* works in buyers' packages.

Crude naphtha.—Available supplies are small and readily command 6½d. to 7d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 7½d. to 1s. 8½d. per gallon and 90/190 heavy naphtha is 1s. 3½d. to 1s. 4½d. per gallon.

Motor benzole is 1s. 6½d. to 1s. 7d. per gallon.

Pyridine.—Prices are nominal at 14s. to 15s. per gallon for 90/160 grade and 16s. to 17s. per gallon for 90/140 grade.

Contracts Advertised

Rivetted Steel Main.
Blackpool Gas Department. [p. 102.]

Stoves.
City of Salford. [p. 102.]

Meters.
City of Salford. [p. 102.]

Diaries, Calendars, &c., Received

Seasonable gifts in the form of diaries, calendars, &c., have been received from the undermentioned friends, whose good wishes are cordially reciprocated:

R. & A. Main, Ltd., London and Falkirk.
Peckett & Sons, Ltd., Bristol.
Willey & Co., Ltd., Exeter and London.
Newton, Chambers, & Co., Ltd., Thorncliffe, nr. Sheffield.
Lunt Brothers, Colmore Row, Birmingham.
Dougall's Gas Meters, Ltd., Chiswick Mall, W.4.

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A copy of the "G.J." Calendar and Directory is presented to continuous subscribers.

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London Office (Temporary Address): Bath Rd., Harmondsworth, W. Drayton, Middlesex *Tel.*—West Drayton 2288/9

GAS STOCKS AND SHARES

The chief feature of Stock Exchange business last week was the big buying of British Funds. This had a marked effect on their prices, which have now reached the highest levels since the outbreak of war, while 2½% consols are nearing the best obtained last year. The upward movement also extended to Dominion, Colonial, and home corporation stocks. The activity in the gilt-edged market overshadowed most of the other sections, which were quiet and irregular. Home rail juniors went out of favour, although the debenture issues hardened in sympathy with gilt-edged stocks. Apart from some activity in iron and steel shares, the industrial market remained quiet, and prices generally closed without change. The healthy condition of our banking system is evidenced by the figures which have so far been published for the past year. Dividends are maintained in all cases, while Martin's Bank is distributing 15% against 14½%.

There was a shade more business in the Gas Market, but apart from Gas Light stocks it cannot be said that the section derived any benefit from the buoyancy of the gilt-edged market. Holders of gas stocks are naturally reluctant to sell at the current low prices unless absolutely obliged, and in the absence of business or inquiries there can be little, if any, change in the quotations. It will be seen in the list below that Gas Light units were marked up 1s. 3d. to 16s. 9d., and several of the Company's fixed-interest stocks also hardened. Imperial Continental rose 1½ on a narrower margin, and inquiries for Bournemouth sliding scale stock led to an increase of 7 points to 147; the last recorded transaction in this stock was at 180 in August, 1939. Commercial dropped a point to 52, and Croydon reacted 2½ to 102½, also on a smaller margin. On the Provincial Exchanges, Liverpool ordinary closed 2 points higher at 101½, while nominal quotations in the Supplementary List remained unchanged.

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 5	Rise or Fall on Week.
1,767,439	Sept. 4	8	8	Alliance & Dublin Ord. ...	115—125	...
374,000	Dec. 27	4	4	Do. 4 p.c. Deb. ...	73—78*	...
877,576	Nov. 6	5	5	Assed. Gas & Water U'd'ts Ord.	14/6—16/6	...
500,000	"	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	17/—19/—	...
535,545	"	4	4	Do. 4 p.c. Red. Cum. Pref.	15/—17/—	−1/−
318,730	"	4	4	Do. 4 p.c. Irred. Cum. Pref.	15/—17/—	...
750,000	Sept. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	80—85	...
560,070	Aug. 21	7	7	Barnet Ord. 7 p.c.	110—120	...
300,000	Oct. 9	1/9⅜	1/4⅜	Bombay, Ltd.	19/6—20/6	...
181,185	Aug. 21	9½	9½	Bournemouth Sliding Scale ...	142—152	+7
690,526	"	7	7	Do. 7 p.c. max. ...	115—125	...
493,960	"	6	6	Do. 6 p.c. Pref. ...	112—117	...
50,000	Dec. 18	3	3	Do. 3 p.c. Deb. ...	68—73	...
362,025	"	4	4	Do. 4 p.c. Deb. ...	90—95	...
335,000	"	5	5	Do. 5 p.c. Deb. ...	102—107	...
357,900	Aug. 21	7½	7½	Brighton, &c., 6 p.c. Con. ...	105—110	...
689,955	"	6½	6½	Do. 5 p.c. Con. ...	100—105	...
205,500	"	6	6	Do. 6 p.c. 'B' Pref. ...	95—105	...
855,000	Sept. 18	8	7	British Ord.	90—95	...
100,000	Dec. 18	7	7	Do. 7 p.c. Pref.	118—123	...
350,000	"	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	108—113	...
120,000	"	4	4	Do. 4 p.c. Red. Deb. ...	73—78	..
450,000	"	5	5	Do. 5 p.c. Red. Deb. ...	98—103	...
100,000	22 May '33	6	4	Cape Town, Ltd.	¼—⅜	..
100,000	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref.	¼—⅜	...
150,000	Dec. 18	4½	4½	Do. 4½ p.c. Deb.	55—65	...
626,860	July 17	6	6	Cardiff Con. Ord.	95—105	...
237,860	Dec. 18	5	5	Do. 5 p.c. Red. Deb. ...	95—100	...
98,936	Oct. 9	2/−	2/−	Colombo Ord.	1⅞—1⅞	...
24,510	"	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	20/6—22/6	...
739,453	Sept. 27	−/11.48	−/11.48	Colonial Gas Assn. Ltd. Ord. ...	15/—17/—	...
296,144	"	1/3.30	1/3.30	Do. 8 p.c. Pref.	20/6—22/6	...
1,775,005	July 31	4	4	Commercial Ord.	47—57	−1
140,000	Aug. 21	4	4	Do. 4 p.c. Red. Pref. ...	88—93	...
620,000	Dec. 11	3	3	Do. 3 p.c. Deb.	55—60	...
286,344	Aug. 21	5	5	Do. 5 p.c. Deb.	85—95	...
200,000	"	3½	3½	Do. 3½ p.c. Red. Deb. ...	94— 99	...
807,560	July 31	7	7	Croydon sliding scale	100—105	−2½
644,590	"	5	5	Do. max. div.	80—85	...
620,385	Dec. 27	5	5	Do. 5 p.c. Deb.	90—100	...
608 660	Aug. 21	5	5	Dudley, Brierley Hill & Dist. Ord.	100—105	...
82,275	"	5	5	Do. 5 p.c. Con. Pref. ...	92—102	...
79,000	"	3½	3½	Do. 3½ p.c. Red. Deb. ...	94—99	...
239,000	July 31	5	5	East Hull Ord. 5 p.c.	80—90	...
187,215	Aug. 21	6	5½	East Surrey Ord. 5 p.c. ...	98—103	...
176,211	Dec. 18	5	5	Do. 5 p.c. Deb. ...	90—100	...
250,000	Nov. 13	8	4	Gas Consolidation Ord. 'B' ...	14/—17/—	...
250,000	"	4	4	Do. 4 p.c. Red. Cum. Pref.	16/—18/—	...
19,152,410	July 31	5⅜	5⅜	Gas Light & Coke Ord. ...	16/3—17/3σ	+1/3
2,600,000	"	3½	3½	Do. 3½ p.c. max.	58—63	...
4,477,106	"	4	4	Do. 4 p.c. Con. Pref. ...	79—84	+2
2,993,000	Jan. 2	3½	3½	Do. 3½ p.c. Red. Pref. ...	80—90*	...
8,602,497	Nov. 27	3	3	Do. 3 p.c. Con. Deb. ...	68—73	...
3,642,770	"	5	5	Do. 5 p.c. Red. Deb. ...	100—105	...
1,500,000	"	4½	4½	Do. 4½ p.c. Red. Deb. ...	99—104	+1
700,000	Sept. 4	3½	3½	Do. 3½ p.c. Red. Ded. ...	85—90	...
270,466	July 31	6	6	Harrogate New Cons.	95—100	...
157,500	Mar. 20	‡1/−	‡1/−	Hong Kong and China Ord. ...	¼—⅜	...
5,600,000	Oct. 23	12	4	Imperial Continental Cap. ...	69—74	+1½
172,810	July 31	3½	3½	Do. 3½ p.c. Red. Deb. ...	81—86	...
63,480	Dec. 18	3	3	Maidstone 3 p.c. Deb.	55—60	...
45,000		†10	†8	Malta & Mediterranean ...	92—102	...
				Metropolitan (of Melbourne) ...		
392,000	Oct. 2	5½	5½	5½ p.c. Red. Deb.	95—100	...
231,977	Aug. 21	5	5	M.S. Utility 'C' Cons.	75—80	...
968,658	"	4	4	Do. 4 p.c. Cons. Pref. ...	72—77	−½
390,076	Dec. 18	4	4	Do. 4 p.c. Deb. ...	72—82	−3
148,955	Dec. 18	5	5	M.S. Utility 5 p.c. Deb. ...	95—100	...
125,000	Jan. 2	3½	3½	Do. 3½ p.c. Red. Bds. ...	90—95*	−1
675,000	Nov. 6	†3	†4	Montevideo, Ltd.	50—60	...
250,000	Aug. 21	7½	7½	North Middlesex 6 p.c. Con. ...	105—115	...
396,160	July 31	5	5	Northampton 5 p.c. max. ...	90—95	+2
300,000	Nov. 6	†7	9	Oriental, Ltd.	118—128	...
468,537	Dec. 11	8	7	Plymouth & Stonehouse 5 p.c.	98—103	...
621,667	July 31	8½	8½	Portsmouth & Gosport Cons.	12—117	...
241,446	"	5	5	Do. 5 p.c. max.	80—90	...
73,350	"	5	5	Do. 5 p.c. Pref.	80—90	...
75,000	"	4	4	Do. 4 p.c. Pref.	70—80	...
114,000	July 31	5	5	Preston 5 p.c. Pref.	90—100	...
247,966	Dec. 18	4	4	Primitiva 4 p.c. Cons. Deb. ...	93—98	...
625,959	July 17	4	4	Do. 4 p.c. Red. Deb. ...	93—98	...
15,000	Sept. 4	6	6	San Paulo 6 p.c. Cum. Pref. ...	7½—8½	...
441,275	Oct. 9	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	16/—19/—	...
460,810	Oct. 2	−/10⅝	−/10⅝	Do. 4½ p.c. Red. Cum. Pref.	17/—19/—	...
133,201	Aug. 21	5	8½	Shrewsbury 5 p.c. Ord. ...	107—117	...
9,000	June 5	†4	†4	South African Ord.	4—5	..
1,996,297	Aug. 21	1/2⅜	1/2⅜	South East'n Gas Cn. Ld. Ord.	15/6—17/6	...
1,000,000	"	−/10⅜	−/10⅜	Do. 4½ p.c. Red. Cum. Pref.	17/—19/—	...
769,191	"	4	4	Do. 4 p.c. Cum. Pref. ...	14/6—16/6	...
150,000	"	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	..
6,709,895	July 31	6	5	South Met. Ord.	61—66	...
1,135,812	"	6	6	Do. 6 p.c. Irred. Pref. ...	98—103	+1
850,000	"	4	4	Do. 4 p.c. Irred. Pref. ...	73—78	...
1,895,445	Dec. 27	3	3	Do. 3 p.c. Deb.	62—67	...
1,000,000	July 17	5	5	Do. 5 p.c. Red. Deb. ...	97—102	...
600,000	"	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	92—97	...
1,543,795	July 31	6	6	South Suburban Ord. 5 p.c. ...	77—82	...
512,925	"	5	5	Do. 5 p.c. Pref.	90—95	...
500,000	"	4	4	Do. 4 p.c. Pref.	75—80	...
250,000	"	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	85—90	...
888,587	Dec. 11	5	5	Do. 5 p.c. Deb.	93—98	...
250,000	"	4	4	Do. 4 p.c. Deb.	77—82	..
200,000	July 31	3	3½	Do. 3½ p.c. Red. Deb. ...	85—90	..
427,859	Sept. 18	1/2⅜	9⅜	S. Western Gas & Water Ord.	13/—15/—	...
160,523	Oct. 9	−/10⅜	−/10⅜	Do. 4½ p.c. Red. Cum. Pref.	17/6—19/6	...
110,000	Dec. 18	4	4	Do. 4 p.c. Red. Deb. ...	90—95	...
750,541	July 31	5½	5	Southampton Ord. 5 p.c. ...	75—85	...
148,836	Dec. 27	4	4	Do. 4 p.c. Deb.	75—80	...
350,000	July 31	5½	5½	Swansea 5½ p.c. Red. Pref. ...	90—100	...
200,000	Dec. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—100	..
1,076,490	July 31	6½	6½	Tottenham and District Ord....	85—95	...
409,835	"	5½	55½	Do. 5½ p.c. Pref.	95—105	...
62,235	"	5	4	Do. 5 p.c. Pref.	85—95	...
453,380	Dec. 11	4	4	Do. 4 p.c. Deb.	78—83	...
1,247,505	Oct. 23	6		U. Kingdom Gas Cor. Ord. ...	13/—16/—	...
1,085,952	Nov. 20	4½	4½	Do. 4½ p.c. 1st Cum. Pref. ...	14/—16/—	...
772,709	"	4	4	Do. 4 p.c. 1st Red. Cum. Pf.	14/6—16/6	...
745,263	Dec. 18	4½	4½	Do. 4½ p.c. 2nd Non-Cum. Pf.	12/6—14/6	...
1,093,656	Sept 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	85—90	...
378,106	Mar. 6	7	7	Uxbridge, &c., 5 p.c.	90—100	...
133,010	"	5	5	Do. 5 p.c. Pref. ...	95—105	...
1,371,138	July 31	7	6½	Wandsworth Consolidated ...	88—93	...
2,525,768	"	4	4	Do. 4 p.c. Pref.	73—78	...
1,343,964	Dec. 18	5	5	Do. 5 p.c. Deb.	90—100	...
383,745	"	4	4	Do. 4 p.c. Deb.	75—80	...
400,000	"	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	90—95	
558,342	July 31	6¼	6¼	Watford and St. Albans Ord. ...	90—100	...
200,000	"	5	5	Do. 5 p.c. Pref.	85—95	...
200,000	"	5½	5½	Do. 5½ p.c. Pref.	90—100	...
200,000	"	4	4	Do. 4 p.c. Rd. Pf. (1973/8)	85—90	...
100,000	"	—	33/4§	Do. 4 p.c. Red. Pf. (1959)	95—100	...
200,000	Dec. 11	3½	3½	Do. 3½ p.c. Red. Deb. ...	83—88	...

σ.—The quotation is per £1 of Stock. * Ex. Div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Contd.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations Jan. 5.	Rise or Fall on Week.
202,152	Sept. 4	5	5	Ascot Ord.	80—90	...
128,182	Dec. 27	5	5	Do. 5 p.c. Pref. ...	88—93	...
31,035	Aug. 21	-/4⅛	-/4⅛	Associated Utilities 4 p.c. Pref.	15/—17/-	...
100,000	Dec. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
17,000	Aug. 21	8	8	Bognor Orig. Ord. 'A' ...	105—115	...
62,210	,,	8	8	Do. New Add. 'A' ...	105—115	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	100—110	...
37,440	July 31	10	10	Cam. Univ. & Town 10 p.c. max.	110—120	...
125,970	,,	7	7	Do. 7 p.c. max.	90—100	...
39,025	,,	5	5	Do. 5 p.c. max.	80—90	...
96,410	July 17	4½	4½	Cardiff 4½ p.c. Pref. ...	92—97	...
55,520	July 31	6	6	Colchester 6 p.c. Pref.	95—100	...
90,550	Sept. 18	5	5	Do. 5 p.c. Deb. ...	100—105	...
150,000	July 31	4	4	Croydon 4 p.c. Pref.	70—75	...
130,000	Dec. 27	4	4	Do. 4 p.c. Deb.	75—80	...
65,000	Aug. 21	7½	7½	Eastbourne 'A' 5 p.c.	105—115	...
198,000	,,	6	6	Do. 'B' 3½ p.c.	90—100	...
112,312	,,	5	5	Do. 5 p.c. Pref.	90—95	...
130,000	Dec. 18	5	5	Do. 5 p.c. Deb.	95—105	...
130,500	Aug. 10	7½	7½	Exeter New Ord. (£10) ...	10—12	...
24,000	Aug. 21	8½	8½	Gt. Yarmouth 8½ p.c. max. (£30)	15—20	...
59,400	,,	7½	7½	Do. 7½ p.c. max. (£30) ...	10—15	...
51,160	Dec. 11	5½	5½	Do. 5½ p.c. Deb.	102—107	...
152,600	Sept. 4	9	8	Guildford Cons.	110—120	...
54,055	,,	5	5	Do. 5 p.c. Pref.	90—95	...
68,250	Dec. 11	5	5	Do. 5 p.c. Deb.	90—95	...
156,600	Aug. 21	7	7	Hampton Court Cons. ...	100—110	...
86,046	June 19	‡4⅛	‡5	Holyh'd&N.W.G.&W.Cpn.Ord.	13/6—15/6	...
80,000	Aug. 21	4	4	Lea Bridge 4 p.c. Pref.	65—75	...
60,000	,,	6	6	Do. 6 p.c. Pref.	105—115	...
94,876	Dec. 18	4	4	Do. 4 p.c. Deb.	75—80	...
73,620	Sept. 18	8⅜	8⅜	Luton Cons. 'A'	115—125	...
107,960	Sept. 18	5½	4	Mid Kent Ord. (£10)	7½—8½	...
230,940	July 31	10	10	Oxford & District Ord. ...	135—145	...
47,112	,,	5	5	Do. 5 p.c. Pref.	85—95	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
126,193	Oct. 30	7½	7½	Peterborough Ord.	140—150	...
64,990	Sept. 18	7½	7	Redditch Ord.	100—110	...
166,850	July 31	8	8	Romford Ord.	110—120	...
80,000	,,	4	4	Do. 4 p.c. Pref.	85—90	...
44,000	Sept. 18	5	5	Do. 5 p.c. Deb.	95—100	...
25,570	July 31	5½	5½	Rugby 5½ p.c. Pref.	95—105	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
42,750	Dec. 11	5½	5½	Do. 5½ p.c. Deb.	103—108	...
110,950	Aug. 21	8	8	Ryde Ord.	110—120	...
270,086	Sept. 4	7	7	Slough Ord.	100—110	...
21,000	Dec. 11	5	5	Do. 5 p.c. Deb.	92—97	...
28,872	Nov. 6	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	14/—16/-	...
28,866	Sept. 18	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
117,228	Aug. 21	7	5	Swindon Cons.	70—80	...
60,425	Dec. 18	5	5	Do. 5 p.c. Deb.	92—97	...
64,380	,,	5	5	Torquay & Paignton 5 p.c. Pref.	82—87	...
130,000	Aug. 21	8	5	Wakefield Ord	85—95	...
81,650	,,	5	5	Do. 5 p.c. max.	75—80	...
82,000	July 31	6	6	Weymouth Ord.	80—90	...
273,626	Aug. 21	7	7	Wolverhampton Cons. Ord. ...	95—105	...
98,384	,,	6	6	Do. 6 p.c. Pref.	105—115	...
160,000	Dec. 18	5½	5½	Do. 5½ p.c. Red. Deb. ...	100—105	...
106,490	Aug. 21	5½	5½	Wrexham Ord.	70—80	...
90,000	Dec. 18	5	5	York 5 p.c. Red. Deb.	95—100	...
133,640	July 31	6½	6	Yorktown (Cam.) 5 p.c. Cons.	80—90	...
120,000	,,	5	5	Do. 5 p.c. Pref.	85—95	...
35,000	Dec. 18	5½	5½	Do. 5½ p.c. Deb.	103—108	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 5	Rise or Fall on Week
347,756	July 31	6	5	Bath Cons.	107—112	...
1,667,250	,,	5	5	Bristol, 5 p.c. max.	97—100	...
120,420	Dec. 18	4	4	Do. 1st 4 p.c. Deb. ...	88—92	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	88—92	...
328,790	,,	5	5	Do. 5 p.c. Deb.	108—112	...
274,000	July 31	5	5	Newport (Mon.) Ord.... ...	93—95	...
13,200	Sept. 4	8½	7	Pontyp'l Gas & W. 10 p.c. 'A'	12—13	...
13,600	,,	6	5	Do. 7 p.c. 'B'	10½—11	...
40,000	,,	6	5	Do. 7 p.c. 'C'	10½—11	...
140,778	July 31	5	5	Weston-super-Mare Cons. ...	93—98	...
64,338	Dec. 27	4	4	Do. 4 p.c. Deb.	90—95	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	140—150	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 5	Rise or Fall on Week
157,150	July 31	6½	5	Chester 5 p.c. Ord.	100—103	...
92,500	Dec. 18	4	4	Do. 4 p.c. Pref.	80—84*	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	86—88*	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—99*	...
2,167,410	Aug. 21	6	6	Liverpool 5 p.c. Ord.	101—103	+2
245,500	Dec. 18	5	5	Do. 5 p.c. Red Pref. ...	94—99*	...
306,083	July 17	4	4	Do. 4 p.c. Deb.	99—101	...
106,280	July 31	10	10	Preston 'A' 10 p.c.	174—184	...
188,219	,,	7	7	Do. 'B' 7 p.c.	126—136	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 5	Rise or Fall on Week
122,577	Aug. 21	7	7	Blyth 5 p.c. Ord.	115—120	...
732,000	Aug. 21	3	3	Hartlepool G. & W. Cn. & New	65—66	...
2,061,315	July 31	5⅔	5	Newcastle & Gateshead Con.	18/9—19/3a	...
682,856	,,	4	4	Do. 4 p.c. Pref.	87—89	...
776,706	Dec. 27	3½	3½	Do. 3½ p.c. Deb.	78—80	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	98—103	...
332,351	Aug. 21	6	6	Sunderland 6 p.c. max. ...	110—120	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 5	Rise or Fall on Week
542,270	Aug. 10	9	6	Derby Con.	100—110	...
55,000	Dec. 18	4	4	Do. 4 p.c. Deb.	98—103	...
20,000	June 19	5	5	Long Eaton 5 p.c. Pref. ...	9—11	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	100—105	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 5	Rise or Fall on Week
10,000	Aug. 21	10	10	Great Grimsby 'A' Ord. ...	170—180	...
6,500	,,	10	10	Do. 'B' Ord. ...	170—180	...
79,000	,,	10	10	Do. 'C' Ord. ...	160—170	...
1,806,339	Feb. 20	6½	6½	Sheffield Cons.	119—122	...
95,000	Jan. 3	4	4	Do. 4 p.c. Deb.	98—100*	-1

a The quotation is per £1 of Stock.
* Ex. div. ‡ For year.

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